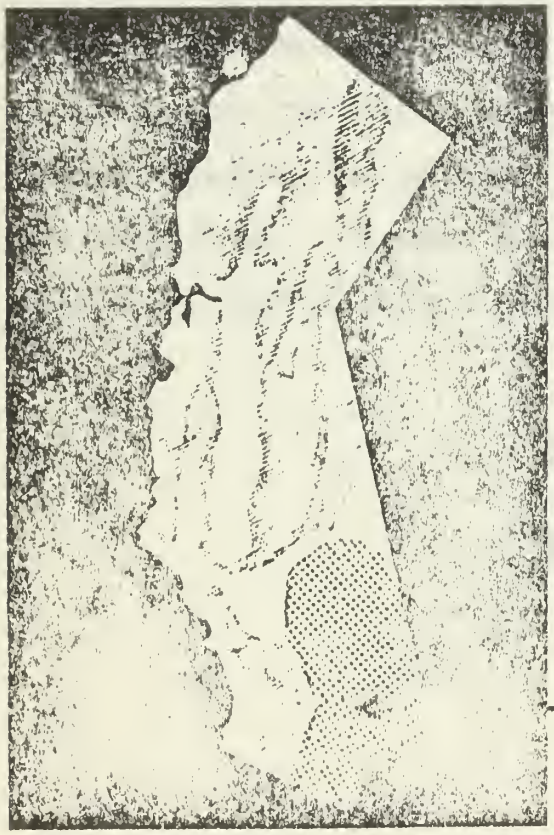
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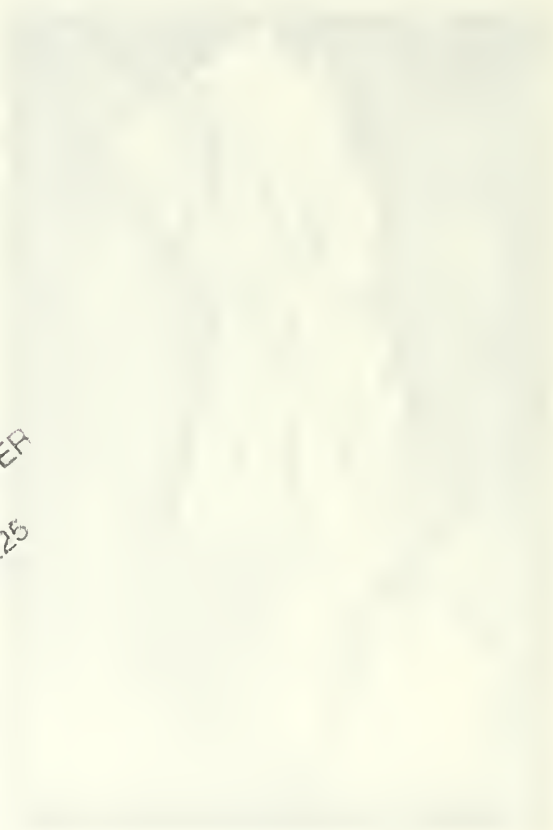
Phase II. The Need for a Comprehensive Plan



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FORWORD

This report on 'The California Desert...Phase II. The Need for a Comprehensive Plan" was compiled by a review committee of the California State Office, Bureau of Land Management. The committee consisted of the State Director, the Assistant State Director, Manager of the Riverside District, Assistant to the State Director, and representatives of the Office of Program Development, Division of Resource Program Management, Division of Lands and Minerals and Division of Engineering. Much credit and thanks is due to 12 members of the Bureau's Portland and Denver Service Centers who contributed preliminary papers that were used in compiling this report. Special mention is given the Pacific Southwest Forest and Range Experiment Station in Berkeley for technical editing work done in setting up this Review Draft. We thank the many persons, agencies, and organizations who assisted us in our work to date.

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Thought is being given to changing the Table of Contents to better recognize the basic land-people relationship that is so important concerning the direction management of the Desert must take.

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PART I: AN OVERVIEW

It stretches as far as the eye can see. The traversing sun spreads waves of light and shadow. Occasional isolated oases of greenery rise above the bronze sea. But more often, the eye sees ranges of brown-sheathed mountains--their peaks and valleys sculptured by wind, water, and the relentless advance of time. This is the California Desert--a 16-million acre national treasure.

Here in the fragile desert environment distances meet at the point where sky and sand embrace in the far horizon, where silence prevails--to be shattered by the march of men or the roar of thunder, where fossils and artifacts lie buried but ready to contribute to man's understanding of his past, and where resources wait to enrich his future.

In an almost infinite variety of natural and geologic features, the California Desert unfurls its beauty and fascination. In the north, spiraling castles of Tufa Pinnacles soar upward. Not many miles to the west, Bedrock Canyon stuns the eye with its kaleidoscopic rainbow colors. Throughout the Desert, the grandeur of the landscape varies from flat, seemingly endless valleys to towering peaks. In few settings can man better grasp the immensity of nature.

Southward from the Sierra Nevada and Death Valley, the Desert extends 240 miles to the Mexican border. From its eastern edge along the mighty Colorado River, it sweeps, westward 100 miles to meet virtually head on with two of the fastest growing urban centers

in the United States: the sprawling Metropolitan Los Angeles Complex and the San Bernardino-Riverside-Ontario Comples.

From almost any point in Southern California, it is possible to reach the Desert in a half-day's driving time. And the entire Desert is within 4 hours' driving distance from Greater Los Angeles, with 11 million people in the city and surrounding suburbs. This complex includes 19 of the top California cities of 75,000 inhabitants and over.

Population growth, coupled with greater leisure time and higher incomes, are turning ever more people toward the Desert. Consider these statistics: Residents of Metropolitan Los Angeles own nearly 5 million passenger vehicles, 350,000 motorcycles, 30,000 dune buggies, and 200,000 house trailers. Urban areas, beaches, and nearby mountains cannot absorb the pressure. The people look to the Desert -- to find clean air, recreation, open space, natural beauty, relief from congestion, and even home sites.

The march to the Desert has created unforeseen, unplanned, and uncontrolled demands for increased uses of land that was once regarded as desolate, dry, unliveable -- and left unwanted. But in reality, this was land whose wealth and full potential remained to be tapped.

Of the Desert's 16-million acres, the Bureau of Land Management is responsible for nearly 11-million acres. Traditionally, BLM served as custodian of the public land. Proper management was precluded by unplanned, uncoordinated land disposals under thousands of outdated public land laws. The growing demands for new land uses and for more services and facilities in the Desert conflicted with this

traditional role. But the Bureau lacked clearcut direction, adequate funds, and manpower to manage the Desert effectively.

Lack of direction need not be a problem any longer. For the policies that the Bureau must follow in management are clearly stated in the Classification and Multiple Use Act, the Public Sales Act--both enacted in 1964--and the Bureau's Planning System implemented in 1969.

What is still lacking and needed now are the funds and manpower to develop a comprehensive plan for short range and long range programs. This plan would enable the Bureau to protect and preserve the fragile desert from misuse, abuse, damage, and deterioration. And it would allow the Bureau to manage the Desert in the terms it merits--as a national resource.

In 1967, the Bureau launced the California Desert Study, with some ground work and a special study of problems associated with off-road vehicular use. The following year, it teamed up with the U.S. National Park Service's Western Regional Office in Phase I of the Study--a preliminary investigation of recreation potential and demand on public domain desert lands. Their report--"The California Desert"--demonstrated that the Desert has great potential for providing outstanding outdoor recreation and is, in fact, serving far more people than had been realized. But the enormous demands being made on the Desert can soon lead to a reduction or total destruction of recreation opportunities.

The follow-up to that study came is in this Phase II of the California Desert Study. All available evidence was marshaled to demonstrate the urgent need for a comprehensive plan. A general

appraisal was made of the over-all planning needs. Some needs were found to be so critical that taking corrective action ought not wait. Existing data and information useful in planning were brought together. Each major resource was analyzed to determine its relative importance to the whole and to other sources and their uses. Here are some highlights of the findings:

Minerals: The greatest mineral potential in the State lies in the desert Area.

Scientific Values: Rich in archaeological, paleontological, and historical treasures, the Desert is an outdoor laboratory of priceless value to the educator, the researcher, the student.

Watersheds: Flood damage and sedimentation rates can be expected to rise dramatically as desert uses increase and capital improvements made.

Soils: Identifying and understanding soil capabilities will help in resolving conflicting uses.

Range Forage: More intensive management of ranges can help maintain the proper ground cover and enhance the values of other resources.

Wildlife: In the future many wildlife experts believe that non-consumptive uses, such as wildlife viewing and scientifice study, may be much more significant than consumptive uses.(hunting)

Fish: Reservoirs and streams in the Desert attract some of the heaviest angler use in California.

Recreation: All signs point to an astonishing increase in visitor-days--from nearly 5 million in 1968 to more nearly 50 million by the year 2000 if a proper development program is undertaken.

Land: Supporting all other resources is land--and only by knowing more about the land can the Desert be managed properly.

Phase II of the California Desert provides a broad overview of the need for planning. To develop a comprehensive plan, the Bureau needs more information about the location, amounts, and uses of resources and the demands on resources. It must decide on the goals that should be reached. It must plan to provide adequate protection and other public services, transportation, and communication facilities. It must determine which items are needed to preserve the desert environment and to satisfy intensive public demands for new uses. It must consider the needs, plans, and responsibilities of local, State, other Federal agencies, and of the private sector. And it must be able to plan systematically--by considering alternative, setting up priorities, and balancing costs against worth.

All of these steps require the means. And there lies the biggest impediment to immediate action. The need is urgent. What is at stake simply is the environmental quality of a great national resource--the people's desert lands--its preservation and not exploitation, its protection and not destruction, its proper use rather than abuse. Only by acting now can both present and future generations be assured of sharing the uncommon riches of the California desert.

PART II: SUMMARIZATION

Rich in untapped natural resources, the 16-million acre California Desert faces the continuing onslaught of a burgeoning population. It lies near two of the fastest growing population centers in the United States. Recreation, wildlife, fish, range forage, watersheds, minerals, and scientific, historic, and educational values are but a few of the many resources there. Their development and management are made vitally important by the mounting impact of the people pressure coupled with rising demands for more services and facilities.

Responsible for administering 11-million acres of the Desert, the Bureau of Land Management now lacks the manpower and funds to protect these lands from deterioration and abuse and to foster their use in a mixture that will assure that future generations will also benefit.

This report summarizes findings in a reconnaisance study of the Desert and its resources. The study identifies the Desert as a resource having national significance, explains the urgent need for a comprehensive plan of management, suggests opportunities and alternatives for management, and outlines the steps and estimates the cost of developing an information base for planning.

It is necessary that priorities of action be established. It is essential that a time sequence for these actions be implemented. From analysis of the data herein, these are the priorites; however, it must be recognized that even within these broad priorites there are many priorities that must be studied and tested.

I - Protection of the Irreplaceable resources that wealready know about.

Resources:

This would involve the identification, location, and determination of the means to preserve such items as the giant indian intaglios - who as yet no one know who, or what they represent, when they were built or why - a section of the old plank road across the Imperial Dunes - Historic Old Fort Paiute - the Spanish trail segment that is still identifiable, and some of the most endangered and important pictographs and petroglyphs are only a few.

II- Establishment of a protective Ranger patrol to provide resource protection and also provide for visitors safety and guidance.

Every day additional damage to fragile resources occurs; the rights to enjoy campgrounds are violated by motorcycles; people become lost; and facilities are destroyed. Even major crimes are committed. We must get people into the field equipped to cope with these problems. Two subsidiary programs of a priority nature are needed to effect the establishment of a uniformed ranger force.

(1) Legal authority to cite and arrest.

(2) A communications system.

III. Develop post haste a comprehensive plan for the management, use, and protection of the California Desert.

Due to the complexities of resource occurrence and uses, the inter-relationships of programs, the imminent pressures of man and his needs for many things ranging from silver to solitude, and the policy demands to provide all things possible under a concept of multiple use it becomes obvious that the mission cannot succeed without comprehensive, detailed planning.

IV. Provide for the rapid expansion of conservation education at all levels.

The sheer size and variety of resources and uses demands that much of the desert management and enjoyment must result from the efforts of an informed public. The Desert can be many things to many people only if the people are educated about the desert. The key to this program is the desert center as an educational and directional but supported by its satellite way stations which in themselves are interpretive centers. These centers must also be informational and control points, but their major mission should be educational and interpretive in nature, at least for a time.

V. Provides for the safe and sanitary use of areas that are already heavily used as primary recreational use areas.

Some areas such as the Imperial Dunes, Trona Pinnacles, Stoddard Wells, to name a few, are already heavily used for recreational pursuits, and their place in the multiple use scheme of management is fairly clean. These areas should be developed with suitable facilities as soon as possible.

RESOURCES

MINERALS

The California Desert holds the State's richest mineral potential. Each year, it yields more than $160 million worth of raw minerals as they come from the ground. In refined or converted form, the worth of the 50 individual mineral commodities would be enhanced considerably. By 1980, the yield can be increased to at least $300 million. But this potential cannot be realized unless some important conflicts are resolved.

Probably the biggest obstacle is the massive number--250,000---locatable mining claims, most of which--more than 95 percent--are illegal or invalid because of lack of mineral discovery. Of the total number of claims, probably not more than 500 would meet the test of validity. It is these supurious mining claims that create the problem of title contamination. Legitimate mining operations may never need to occupy more than one-fourth of 1 percent of the Desert Area. Therefore, it is the spurious claim that conflicts with other uses of the Desert, such as grazing, wildlife, urban development, and recreation. Mining and recreation can, for example, be compatible and not in conflict. Old mining camps of the West are prime focal points of tourists. With a realistic mineral management program, mining can complement a public recreation and tourism program.

But before such a program can be carried out, there needs to be greater understanding amoung industry, government, and the public. A mineral management system is needed which will encourage mineral exploration minimizes the impact on the environment, and costs the Bureau only a nominal amount to administer.

If a mineral program is to benefit the public it must meet public's demand for minerals and still protect the over-all desert environment. If the program is to be acceptable to industry, it must be in accord with the principles of the basic mining law of 1872, and create an invironment in which industry could operate with confidence and free of harassment. And the program to be acceptable to the Bureau, must provide for ease and economy of administration, and be compatible with other resource programs.

Prerequisite to any mineral program is a basic mineral and geologic inventory of all leasable,locatable,and salable minerals in the California Desert. Only with such information on hand will it be possible to frame a management plan that would consider the interests of the public, the mining industry, and the Bureau.

To retain the basic mining law of 1872 and meet the general requirements of a program, some supplemental legislation is rrquired. But above all, supurious or invlaid claims must be disposed of because the location of invalid mining claims is a constant drain of the Bureau's limited resources.

Several alternatives are possible. The Desert Area, for example, could be set up as an area for the trial development of a more efficient plan for mining. All existing claims would be investigated and those that are invalid would be eliminated. Miners would then be granted prospecting permits, subject to revewal, good for 3 years. Claims of any discoveries would be located accurately. They would then be evaluated by the Bureau. When a permit has served

its intended purpose and expired, the unlocated land immediately becomes open to further application for processing. A mineral patent would convey only the mineral estate--not the entire fee title. When the mineral estate is conveyed, the surface state should be subordinate.

We suggest a 5-year program that could stimulate private mineral production on the Desert by some $50 million to $100 million annually, possibly yielding revenues of $1 million annually to the Government. And the Nation's economy could benefit by at least $250 million a year.

SCIENTIFIC VALUES

The scientific values of the California Desert include priceless archaeological and historical treasures that, in many instances are "hanging by a thread" as to their existence. The people pressure has exacted a frightening toll by destroying or damaging relics of interest and value to the scientist, researcher, and educator. Probably the most important single factor has been the activity of the "pot hunter" who removes relics or destroys prehistoric expressions of art.

The Desert Area can provide us many answers to many of our questions about the past. In most archaeological sites, only the surface tools remain to verify the habits and living conditions of the earliest inhabitants of the Desert. Fragile indeed is the only remaining evidence of trade and contact between these people.

The potential of the area for paleontological study has only barely been touched. Such studies of fossil animals and plants are found in the Barstow Formation, near Barstow, and in the Mojave Desert. Well-preserved fossil mammals are now considered to be more geographically widespread, and covering a greater time span than was formerly thought. Scientific excavations can lead to better understanding of the indigenous extinct mammalian faunas and allow paleontologists to make more refined correlations and comparison with the better known faunas elsewhere.

But scientific values of the Desert are by no means confined to non-living matter. A special phase of the Desert Study should include a study of reptiles and amphibians. The number of snake and lizard collectors roaming the desert suggest the growing public interest in herpetology. The habitat of desert animals is being destroyed each day because of urban encroachment, intensive recreational uses, road construction, and mineral exploration. Some species are so retricted in their habitat that they are not compatible with other uses of the desert. Only a minimum of planning and management has been done to protect the reptiles and amphibians that live in the desert.

Scores of educational institutions use the Desert as an outdoor research laboratory. No system yet has been fully developed for identifying and preserving the areas that will be needed for these activities. And no guidelines have been developed for relating these educational uses to other resource programs. If these needs are not soon identified, sites for study may never become available because of encroachment from other incompatible land uses.

The Bureau should embark on a long-range program to save these scientific values for study. Some of the problems—archaeology, for example—are so unique that to gain a comprehensive knowledge of the resources, surveys cannot be done from aerial photographs or scattered samplings alone. The entire physical landscape must be covered, step by step. And there is a need for continuing surveys. Furthermore, the Bureau and the State Coordinating Council for Higher

Education should jointly inventory the Desert research and study areas needed by educational institutions. And the Bureau ought to study the need to establish sanctuaries to protect botanical, and zoological species being endangered by other desert uses.

New roads can be built, plants reseeded, new animals introduced. But archaeological and historic sites, and rare and endangered species--if they are lost--they are lost forever.

WATERSHEDS

A desert watershed is commonly thought of as nearly level or undulating topography with vast expanses of unvegetated sand. But the California Desert illustrates the exception. Dunes lie scattered throughout the Desert, but they are few and relatively small. And elevations in the Desert range from below sea level to mountains rising to 8,000 feet. In fact, 60 percent of the Desert is rough and mountainous and only 40 percent gently sloping or nearly level. Furthermore, 90 percent of the Desert soils support some type of vegetation of various species and density, including annuals or perennials.

The California Desert is part of two hydrologic study regions: the South Lahontan and the Colorado Desert. Each region is made up of smaller watersheds, such as the Colorado, Mojave, and Amargosa River drainages. One group of watersheds comprises about 2.5 million acres and is tributary to the Colorado River. The other group consists of 13.5 million acres of watersheds of the closed basin types; that is, they are wholly contained within the desert confines.

The slight amounts of precipitation falling on the Desert do not favor runoff--all rainfall is absorbed by the coarse-textured soils regardless of slope. Only occasionally do localized cloudbursts of short duration and extremely high intensity provide runoff in the interior desert. These outbursts may be more damaging than beneficial to vegetation and soils because of the flowing water's erosive force. Mountains in higher precipitation belts around the Desert perimeter provide some runoff that reaches desert lands.

Scanty, infrequent rainfall and high temperatures both prevent abundant vegetative production. But the ground cover that does exist is, in some places, being destroyed or damaged because of growing use of the Desert. As desert uses increase and capital improvements are made to satisfy demands, flood damage and erosion can be expected to accelerate. Such damage on Bureau lands is now thought to be minimal.

The primary conflicts now appear to be those uses that damage the vegetative cover or destroy stable soil mantle. These uses include off-road vehicle driving, unregulated livestock operations, unregulated vegetation harvesting, mineral explorations, and unplanned road construction. Some of these results may cause harmful soil compaction around desert plants by reducing water infiltration--thereby increasing the already droughty conditions.

The Bureau should...

- Evaluate fully the impact of soil erosion, compaction, off-road vehicle use, and plant destruction on the desert watersheds.
- Conduct basic inventories for information on vegetation, site productivity loss, sources of ground water, and soils for use in developing a sound resources management program.
- Join with the U.S. Geological Survey in developing a method to locate sources of ground water supplies.
- Make an intensive vegetation survey, identifying plants as to location, extent, and condition.

Unless a sound desert watershed management program is developed irreparable loss of vegetation will continue to occur. This loss is

especially damaging to desert esthetics and ecology. For once an area is denuded, soil erosion sets in--the fatal blow to biological life.

runoff and sedimentation; (2) types of plant growth best suited for forage and protective cover; (3) construction of roads, and rights-of-way, campsites, and campgrounds; (4) landscaping; (5) agricultural uses; and (6) multiple uses of desert lands.

Only after we know the physical, chemical, and mechanical properties of the soil can we determine its best use. We also need to know if the soil will be improved or damaged by this use. The only way to put a dollar value on soil is to measure its yield in crops, forage, vegetative cover, water yield, and other land uses put on it. Identifying and understanding soil capabilities will assist the Bureau in resolving many conflicts in desert use.

Ideally, a soils inventory should be completed before planning for management. But because planning for the Desert cannot wait without continued damage from uncontrolled uses, the Bureau should inventory simultaneously while planning. The first priority for inventory should be areas where intensive development and uses are taking place and in areas where additional development is proposed, such as recreation sites.

Coordination of any survey efforts is vital because practically all the resources data can be collected by an inventory team. Coordinations with other agencies that also conduct soil surveys would avoid duplication of efforts.

The climate, soils and latitude of the California desert unite to form a living mantle of unique vegetative cover. Occasional islands of rare desert species delight the visitor and large expanses of valuable food plants combine to provide livestock grazing, wildlife habitat and watershed protection under a delicate ecological balance.

The desert vegetation is exceedingly fragile and receptive to change as a result of climate, grazing and other uses. Man must have adequate knowledge with which he can apply proper management of this plant cover if he is to harvest its wealth.

Grazing by livestock is a part of this desert scene, becoming established over a many year period through the toils of hardy individuals, many owning intermingled private lands in the area.

Within the California desert are nearly 6.0 million acres of forage plants considered suitable for livestock grazing. About 2.5 million acres are of a mixed perennial-ephemeral vegetative type and about 3.5 million acres produce/strictly ephemeral plant type. The livestock use of the Federal rangeland is authorized on a year long basis with minimum direction or control from the Bureau. The present intensity of management may be adequate in some areas. But a considerable acreage reflects unsatisfactory range conditions and needs more management.

The perennial-ephemeral range lies above the 2,500 feet elevation. It has a variety of perennial or permanent range vegetation with an admixture of annuals. The ephemeral range is found in the lower elevations and relies heavily on yearly moisture and temperature conditions for annual seed germination and growth. During an average 5 year period, the forage production of two of the years on this annual range is usually so low as to be unusable while one year produces such an abundant crop it cannot be fully utilized. Of the two types the perennial-ephemeral range is more dependable for forage each year, and therefore, is best suited for sustained livestock grazing.

Overall, the yearly forage production in the desert fluctuates considerably, making it highly undependable as a stable source of livestock feed. But nearly 20,000 to 25,000 cattle, and 100,000 to 140,000 sheep do graze in the desert on the years of good forage growth.

Limited studies to date suggest that about half the perennial-ephemeral ranges are in unsatisfactory condition because of the lack of proper management. Conditions in the ephemeral range have not yet been evaluated adequately.

The Bureau manages its rangelands in the California desert by granting acreage allotments through leases, to qualified livestock operators. Many improvements have been made on publically owned rangelands to make forage more accessible to animals and for ease of managing them. The demand for forage will remain but the opportunity for supplying it on the desert will change because of competing uses of the land and because of economic considerations.

To provide for proper livestock use in the future, it will be necessary to implement the Bureau allotment management system in areas determined to be suitable for grazing. After inventorying the grazing resource, and evaluating its capabilities, conflicts with other uses will be considered. Management objectives can be set providing for livestock and plant needs and for systematic planned use and development of the range.

The system will recognize the role of livestock grazing use in the environment, and provide for the economic, social, and resource advantages which proper livestock use can provide.

To date, nearly 1.5 million acres of range have been inventoried. A minimum of another 2.3 million acres need to be surveyed. And management plans will need to be completed on 26 allotments having resource problems.

Present thoughts are that Bureau managers cannot significantly increase forage by more intensive management, or by techniques such as seeding or reseeding in the California desert. Grazing management can, however, assure a proper vegetative ground cover in range areas. And such a cover will help sustain an existing livestock use and will enhance the value of other resources, including watershed, wildlife habitat, recreation, and scientific values.

WILDLIFE

In the future, non-consumptive uses--such as viewing, photography, and scientific study--of wildlife resources in the California Desert may be more significant than hunting. About half the 9.3 million visits spent in the Desert in 1968 were for non-consumptive uses, with their value estimated at between $43 million and $65 million. The value of the 4.3 million visits spent in hunting is estimated at between $540.7 million and $76.2 million. The present number of visits will undoubtedly climb at a higher rate than that of growth in populaton. Although the dollar value of wildlife resources is hard to project, it will most certainly increase by at least the same rate as visitor use.

The Desert's wildlife resources now seems adequate to sustain present use. But they will not be able to do so under projected additional use without a fully planned program of management. And without management, the wildliferesources will probably dwindle at a rapidly accelerating rate within the next 10 to 15 years.

All evidence points to significant losses--even through quantitative data are not available. These losses are also a consequence of conflicitng uses of the Desert's resources. Bigborn sheep, for example, have lost some habitat and suffered losses in number because of human appropriation of vegetation, water, and space. Deer habitat has probably been lost in some places because of domestic sheep grazing in the northwest part of the Desert Study Area. These are but two examples of conflicts in use of resources. The compatibility of any wildlife species with the various forms of intensive recreation use is not thoroughly understood. But there is enough evidence to suggest the

need for research.

Nearly 200 vertebrate species are found in the California Desert. Important big-game animals include deer, and bighorn sheep; upland game birds include quail, chukar, and dove. Also found here are rabbits and hares, and a large variety and number of non-game animals.

The work that needs to be done is essentially to complete the application of the Bureau's Wildlife Habitat Management System. As a first step, an inventory and then habitat management plans must be completed. Some research is needed on basic biology and ecology.

Present Bureau habitat inventory shows the general locations of major wildlife species in the Desert, but this information is inadequate for planning. We need to complete a detailed inventory for all wildlife species, including reptiles, amphibians, and arthropods. This inventory would provide us data on present and potential habitat, areas that can be used for study and management, relative needs and priorities among areas, management alternatives, and resulting recommendations that can be used in resource planning.

FISH

Fish in the Desert? It may seem paradoxical to think of the California Desert as a source of fish. But then the Desert is not all sandy dunes. Fish thrive in the Salton Sea and its tributaries, in the Lower Colorado River complex, and in the canals, ditches, and peripheral streams near the Desert's western boundary. Fisheries there attract some of the heaviest angler use in the State.

Dwindling in numbers are the severely restricted populations of small desert fish that interest primarily the naturalist, ichthyologists, and student of natural history. These restricted populations suffer from competing uses of water. And much of the remaining favorable habitat is on private land.

The increasing salinity of the Salton Sea is considered the No. 1 fishery problem in California. If the situation becomes worse, there will be a gradual decline in fish populations and the entire fishery may be lost.

The Lower Colorado River complex also faces serious problems. Extensive channel changes and removal of salt cedars and streamside vegetation are having unfavorable effects on acquatic habitat. The future magnitude of the sports fishery and spillover effect on nearby recreation sites are creating a problem in recreation management. The 5,000 miles of canals transporting water from the Colorado River hold what is essentially an untapped fishery. But how to manage it and other fisheries remains a problem.

Destruction of desert fish habitat has been primarlily from diversion of water for other purposes, and from lack of protection of springs from livestock and game. Some of the small springs have warm water that tempt people to introduce tropical fish. The introduction of tropical and other non-indigenous fish has caused serious competition and cross breeding. Some populations have been completely displaced. Remaining populations need to be protected from collectors.

Protection of the present habitat can potentially save some of the remaining population of rare desert fish. With articifical water development and additional work on spring areas, present fish polulations could be shifted to suitable habitat--and their numbers doubled or tripled.

The Bureau is responsible for protecting the habitat of rare and endangered wildlife species in the Desert's public lands. It now lacks the wildlife personnel with fishery training to work on this pressing problem. It should take an active part in habitat inventory, and in the protection and development of restricted populations of desert fish. It should collaborate with various agencies, universities and organizations that have an interest. In addition, the Bureau ought to:

Obtain from qualified scientists and specialists, recommendations for fishery protection and enhancement, and for development of an action program for the desert fishes.

Assist in an intensive inventory of fisheries and the relationship of the public lands next to and on the shoreline of the Salton Sea.

Join in working on fish habitat problems of the Lower Colorado River and the adjacent lands important to the Calfiornia Desert Study.

- Inventory the concentrations and magnitude of the present sport fishery in the canals within the Desert Area.
- Determine the habitat and condition of fish in the peripheral streams.

RECREATION

Whether it's loafing at the beach or blasting over an inland sand dune, recreation forms an essential part of life in Southern California. Recreation pursuits in the California Desert vary from the more sedate activities of picnicing, camping, hiking, driving, sightseeing, phototaking to the more specialized activities of hunting, target shooting, rockhounding, archery, painting, motorcycling, and dune buggying. But the region's burgeoning population, with its increased leisure time, rising income, and greater mobility, is demanding recreational activities at a much greater rate than can now be supplied.

A special survey of outdoor recreation on public lands in the Desert showed that nearly 5 million visitor-days were recorded in 1968. By the year 2000, the number of visitor-days [redacted] could soar to [redacted] 50 million. To date, the Bureau has developed facilities to handle less than 1 percent of the annual recreation use of the Desert. Virtually all recreation use of the Desert is now unregulated.

It is easy, therefore, to understand why we are sustaining extensive historic and archaeologic site damages along with soil and vegetative "erosion." It is easy to understand why pollution--noise, visual, air--is permeating the Desert. And unless there is a program for management and development of recreation, widespread deterioration of the Desert is inevitable.

Guidelines for a recreation program were outlined in the report "The California Desert,"--a preliminary study issued in 1968 that is

concerned primarily with recreation. The report recommended that the Bureau:

1. Set up a criteria to determine proper boundaries for recreation areas.

2. Evaluate special uses, sales, and transfers within the Desert for their recreation potential or values.

3. Estimate the funds and manpower necessary to clear key withdrawn areas with high recreational use of ordnance and unauthorized uses.

4. Consider fully the visual appearance of the Desert in all future developments.

5. Seek legislative authority to enforce rules and regulations on Desert use.

6. Set up a system of [redacted] patrols for the Desert * with uniformed Rangers.

7. Plan recreation developments to meet demands, but at the same time provide opportunities for those seeking solitude, [redacted] adventure and separation.

8. Plan, build, and operate a Desert Center and a system of Way Stations.

9. Encourage concessions and private investments in public accommodations and facilities.

10. Develop a road system through Cooperative planning with State and local governments.

11. Evaluate the specialized recreation activities and the special provisions they may require.

12. Develop facilities for off-road vehicular recreation.

13. Develop motorcycle centers on land where damage to resources would be minimal.

14. Provide education and informational materials to the public.

15. Negotiate agreements with universities and scientific institutions to identify valuable natural or scientific resources.

16. Assume responsibilities for maintenance and cleanup in the Desert.

17. Obtain public participation in planning for the future in the Desert.

The report also points out that the Desert has the physical size and natural attributes essential to satisfy future recreation demands. It identifies 19 areas there that have significant recreational values. These areas will be kept in public ownership and a comprehensive plan developed to insure that these values are not impaired or destroyed.

What is needed now is a systematic plan for inventorying recreation activities, resources, and facilities. This survey would also analyze users, trends in use, and existing and potential demands.

LAND

Without the land, all amenities of the Desert would not exist. Land produces natural resources and allows for their developments. The more common land uses found to have a significant impact on the California Desert are non-resource oriented: (a) urban-suburban, (2) local public purposes, (3) residential, (4) commercial, (5) industrial, (6) agricultural, and (7) land requirements of other government units, such as the armed services, the State, and natural resource agencies.

To know more about the land-use requirements and pressures, the Bureau is using various planning approaches.

The land classification approach has been in existence long enough to be of immediate benefit in a study of the California Desert. Land classification will stabilize the tenure of public lands for the foreseeable future.

To determine fully the importance of the land resource, the Bureau should study the needs of . . .

Urban-suburban land requirements in relation to available public lands adjoining communities, particularly in the Coachella Valley.

Public-purpose uses based on projections by government and non-governmental units.

Residential areas where there may be need for rural homesites development, and develop plans for small public-land parcels in sections fragmented by small-tract programs.

Commercial facilities and their proper placement, particularly in relation to transportation routes and recreation use of the Desert.

Industrial uses, include rights-of-way, particularly in light of acreage economy and common rights-of-way corridors.

Agricultural uses in areas where soil and climatic factors favor development of crops.

Military needs and impact of future requirements on land, and the possibility of joint use of land.

State acquisition program and its impact on the Desert.

Exchange program in the light of other transfer programs.

PROTECTION

Lost in the Desert! This report has a familiar ring to people living in the California Desert. Each week some group or agency is called upon to conduct at least one search-and-rescue mission. To provide for the safety and welfare of desert visitors, the Bureau has to develop a public service organization -- to offer guidance and to answer inquiries about travel to and through the desert.

On lands administered by the BLM in the California Desert, it is estimated that 500 major crimes and 1300 lesser offenses were committed in 1968. And these are conservative estimates. All evidence suggests that damage to the desert is growing at an alarming rate. An adequate protection system is needed if any management program is to be effective.

The Bureau does not now have a protection system for the areas it administers. Funds, personnel, equipment, and facilities are practically non-existent. Total Bureau personnel in the 16-million-acre Desert area at any one time might total 10 men, and they are for management not law enforcement purposes. Laws and regulations are inadequate. Rules and regulations are generally unenforceable. Employees are not trained in law enforcement, make no arrests, are not authorized to carry or use firearms in the line of duty, cite no one regarding Federal law regulation violations other than by Notice of Trespass, and are not able to bring violators of petty offense before a U.S. Commissioner. Protection coordination with State law enforcements offices is limited and is generally by telephone.

Short-range planning should be aimed at (a) completing a protection inventory, (b) eliminating hazards, (c) developing policy and objectives in protection, (d) determining organization and duties of personnel (e) obtaining enabling legislation, laws, and regulations, (f) publishing procedural manuals and guidelines, and (g) training personnel. At the same time that inventory and planning are taking place, the Bureau will need to continue to protect desert resources with the means it has.

Planning to the ultimate level is directed to the year 2000, when 50 million visitor-days are expected in the Desert. We recommend a protection system based on a mixture of systems used by the U.S. Forest Service and by the U.S. National Park Service. Law enforcement should be a coordinated team effort by various agency [redacted] law enforcement officials.

Bureau law enforcement personnel should be empowered to arrest, and to carry and use weapons. Officers should be well trained, and well qualified. Their duties should approximate those of the National Park Service Rangers; in fact, Bureau officers should be identified as Rangers. They should be trained and organized to handle normal search-and-rescue operations, riots, and disasters. Their routine duties should be flexible to respond to changes. They should have the means to communicate quickly and to get to any part of the desert quickly. The protection system should be evaluated periodically by outside specialists and changed to keep up with the times.

Any uses of the Desert that detract from it appearance should be regulated. Desert Rangers should be the focal point for protection activities on a day-to day basis.

COMMUNICATION

Because of the California Desert's vastness, a modern communication system is crucial to efficient management. We must be concerned with the safety and well being of the visitors in the Desert as well as our own workers.

Generally accessible to visitors, the Desert holds potential hazards, natural and man-made, to the unwary. Except in limited areas, there is now no means of rapid communication. The few management personnel available cannot adequately cover the land where visitors might go. Opportunities for crime and for damage to irreplaceable resources are hardly insignificant.

Desert hazards include poisonous reptiles, abandoned mines, unexploded ordnance devices, steep cliffs, dangerous roads, flood areas, and severe storms. And in areas where temperatures soar above 100° five months a year, the missions of search and rescue can be matters of life and death. As a public service, the Bureau must stand ready to answer visitor inquiries about traveling to and from the Desert. With swelling numbers of visitors to the Desert, the problem of crime will increase significantly. Effective crime prevention and detection and law enforcement depend on speedy communication.

The only practical, economical method is electronic communication. A highly sophisticated radio network can cross great distances and overcome mountain barriers. Most radio communication is now directed toward providing information on major highway access routes. The value of this type of operation in developing a desert radio network

is limited. Power sources are not generally available now, and access to key radio transmitter sites may be a problem.

TRANSPORTATION

In the California Desert, the transportation system has grown from a sparse network of native trails to [redacted] proliferation of freeways, highways, and byways. We have come a long way since Juan Bautista de Anza and Pedro Fages blazed the first trails across the Desert in the late 1700's. But the transportation system has been outstripped by the demands of a growing population. Some of the routes are adequate for future needs, but many others are poorly located and built, or fail to protect [redacted] adequately the natural resources of the Desert. For the orderly development of public lands, a coordinated, comprehensive, long-range transportation plan covering all classes of facilities is clearly needed.

As a resource management agency and as the largest landowner in the California Desert, the Bureau is charged with providing access to the public lands there. But existing planning by the Bureau and other governmental units does not adequately provide for the future protection and utilization of these lands. And existing Bureau regulations do not provide for adequate control over the location and building of transportation facilities that [redacted] public lands. Unless something is done to curb these unregulated activities taking place on public lands, the result will be a deterioration of environmental amenities. Historic trails, for example, are not adequately protected and in danger of being obliterated. Unwise use of land has destroyed much of the natural beauty of some sections of otherwise scenic routes. There is no coordinated approach to the establishment of scenic highways and parkways. Deficiencies in road building have resulted in loss

of material from unstabilized surfaces, and to development of parallel trails that scar the landscape.

Preliminary transportation findings reveal:

The appropriation of land for roadways under RS 2477 should be limited.

A desert transportation subcommittee should be setup as part of a Desert Land Advisory Group with responsibility for studying, analyzing, and recommending to the Bureau work on transportation.

On-going activities toward protection of the natural beauty of scenic highways and parkways should be expanded as soon as possible to include all known existing and future routes.

A coordinate route number system for the secondary and feeder highways systems should be established in cooperation with the counties.

An adequately staffed and supported engineering organization for the project area should be provided.

All permanent public roads in existence on desert public lands should be inventoried and such information recorded in the Land Office.

The consideration of these items should be included in a comprehensive planning effort for the desert.

REALTY SERVICES

In support of resource activities in the California Desert, the Bureau will need to provide realty services. These services include work in completing land exchanges, in acquiring easements to aid management programs, and in gaining access to public lands as needs are determined by other than resource activities.

The bulk of the planning effort for the realty activity lies in determining land title transfer, chiefly for consolidating land ownerships for more efficient administration. A reconnaissance survey of the Desert suggests that there is no need for any large release of public lands. Past land policies have left in private hands vast reservoirs of undeveloped lands. In San Bernardino County, for example, private ownership has enough land to meet urban development needs for the next 50 years.

About 10 percent of the public land in the Desert Study Area may be classified for potential title transfer. A good portion of this acreage will probably be exchanged to help other Federal programs. Probably some 100,000 to 300,000 acres might satisfy exchange proponents.

In addition to land disposals, realty services to the public include acting on land applications that require fee grants, and determining public land for retention under the Classification and Multiple Use Act, including land needed for public purposes whether it be in or out of Federal ownership.

Planning is especially needed in public lands surrounding expanding motropolitan areas where the marginal land, land with steep slopes or unstable soils, for example, is often sought by speculators.

As an example of values that might be lost through improper planning, consider scattered tracts affected by expanding metropolitan areas. If planning is weak, or incomplete, these tracts might be sold without their public values being considered. A comprehensive plan would greatly reduce efforts required to evaluate right-of-way proposals by identifying resource conflicts, thus, avoiding unnecessary expenditures for later route change.

The prospects of using Desert lands for other activities are as follows:

Future agricultural developments are practically nil in the Colorado Desert area--even with full development of the Colorado Water Plan.

Urban expansion is expected to be limited because little public land will be used directly for this purpose.

Commercial development will continue to be dictated by location of transportation routes, mineral and recreation development, and availability of water.

Industrial development will probably continue to be closely tied to processing of mineral extraction products.

The military and reclamation withdrawals seem the most fertile fields in which to find land suitable for restoration to public domain or where other uses might be permitted.

The bulk of the pressures for residential lands in the Desert outside of expanding communities will be for recreational retreats, although an adequate number of parcels are already available for development.

CONSTRUCTION AND CADASTRAL

The people pressure on the California Desert probably will not differ radically from people impact on other types of land. Facilities must be built to meet these increasing demands. And then they must be operated and maintained in good order.

The recommendations in this report would call for the construction of an adequate transportation system to accomodate the many desert uses. Facilities to be built would include Interpretive Sites, Recreation Sites, and Way Stations.

A survey of boundaries and subdivisions of land should precede any development of the California Desert. About 40 percent of the total cadastral survey needs have been completed on the 11-million acres of public domain. The remaining 6-million acres require either an original survey or a resurvey. Construction and Management requires identification of land ownership on the ground.

In the 19 recreation and administrative areas presently identified about a million acres of the 2.3-million acres will require survey. This work is necessary to determine and post the exterior boundaries, identify interior private holdings and mineral claims, complete surveys on outside land for exchange purposes, and survey for related access program. Cadastral survey are especially needed in areas of intermingled ownership.

COOPERATIVE PLANNING

The Bureau is the major landowner in the California Desert. But in any management program of the dimensions suggested, it cannot act unilaterally; instead, it must act in concert with other agencies at all levels. The Bureau will need to increase some of its cooperative activities with these other agencies. No changes may be necessary in others. Regardless of the size of the planning effort, all planning should be integrated into a system--one that benefits by the most modern management techniques for sound decision-making, including information retrieval and cost effectiveness studies.

The Bureau will need to determine what problems and conflicts may arise if it should begin a comprehensive planning program and an interim capital improvement program. It will need to consider the mission and responsibilities of other agencies in the Desert and the supporting role it may have to assume to help other agencies in reaching their goals.

With the passage of the Classification and Multiple-Use Act (P.L. 88-607), and introduction of the Bureau's Planning System, the BLM can and should begin cooperative planning for the Desert. In this work, it would be concerned with the plans and programs of agencies in the Departments of Defense; Interior; Health, Education, and Welfare; Agriculture; Transportation; and Housing and Urban Development; and of the National Aeronautics and Space Administration.

The State of California can be expected to be deeply involved in any Desert management program because of its powers to influence planning for growth, development, and public welfare. Many of the

activities of State agencies will affect how the BLM plans. The agencies include Resources, Business and Transportation, Finance, Economic Development, Human Relations, and the Coordinating Council for Higher Education. The possibilities for BLM-State Cooperation in special programs center around educational opportunities, open space, solid waste disposal, airport facilities, industrial potential, development of land use codes, policy for land use, and expansion of photomapping.

The State government has delegated much of its power to local government units that over time have developed a strong tradition of home rule. These local units have an important role in planning for and controlling land use within local jurisdication. Local government units within the Desert Area boundaries should participate actively in any comprehensive planning effort by the BLM.

The local agencies whose planning will be vital to the Bureau's Desert Study include counties, cities, associations of governments, and special districts. In addition, it will be desirable for the Bureau to work closely with the Southern California Association of Governments--a six-county regional planning agency--to identify environmental problems and seek solutions on a regional basis. Within the Desert boundaries are five counties. Four other counties--each heavily populated--have a major impact on use of the Desert. Each of the nine counties have active planning commissions. Several cities within these counties have comprehensive master land use plans.

ECONOMIC ANALYSES

Economic analysis must be an integral part of all planning for the California Desert. Without economic evaluation, needed priorities and best alternatives cannot be determined in deciding on a management program. Certain uses of the Desert can be identified and tangible values assigned. Other uses have recognized values--many of which reflect individual preferences and value judgments that as yet cannot be quantified. Intangible benefits that cannot be measured in quantitative terms include clean air, open space, and other Desert amenities. Yet in any economic analyses, both tangible as well as intangible values ought to be considered.

Among the values of Desert use that have been identified in this report are minerals, and recreation. Over $160 million worth of raw minerals are produced in the California Desert each year. Over the past 5 years, rate of production has risen by more than 24 percent. Recreation use in the Desert complex exceeds 5 million visitor-days. Most values for recreational pursuits cannot be quantified. But if we assume that recreationists spend an average of $5 per person per day, roughly $25 millions could be considered a year's expenditures in the Desert.

If we are to manage the Desert properly and are to identify the conflicts and interrelationships of resources, we need more definitive data. And the contribution of the various resources to the total economy can be defined only by a base study with data on input and output. Such information would provide a realistic base for projecting use of all Desert resources at present levels and at future levels.

An economic base study can use much of the socio-economic information that already exists or data now being gathered by other Federal, State, and local agencies, and private firms.

The major elements of an economic base study would include:

1. Inventory and analysis of economic activity in the Desert Area and its linkage to economic activity outside the area.

2. Development of a profile of the resources available in the Desert Area.

3. Development of a profile of demand variable, or uses of resources.

4. Projection of economic activity in the Desert Area for the years 1980 and 2000, based upon assumptions of continued economic growth and development.

An economic base study should be phased in during the third year of the proposed 5-year comprehensive planning effort. We assume that by then data from the inventories would be available for analysis in the economic base study.

WHAT WILL IT COST?

Program Estimates - California Desert Plan

The information on type of work and magnitude of work load for purposes of developing a program package were derived primarily from the California Desert Plan summaries. The life of the package has been fixed at 5 years and program schedules for this period both in terms of Bureau effort and contract are displayed on other forms. The package has been developed essentially in two parts: the main program being directed toward development of the Desert Plan; and the second part directed toward interim management operations and pre-plan construction. The package is divided into nine major work categories of which the first seven pertain to development of the Desert Plan.

The first work category relates to basic planning controls. Initial requirements of the plan call for determination of boundaries, analysis of on-the-ground control, construction of maps, breakdown of ownership, studies of ADP applicability and development of guidance material to establish ground rules.

The second category is development of the resource information base. Resource data would be compiled from inventories and analyses of existing features such as vegetation, soil, cultural, climatic, hydrologic, watershed, mineral, wildlife habitat, fisheries and recreation. The standards for inventories will have to be such that they will meet the requirements for analyzing the individual resource. For instance, the vegetation inventory would need to be of sufficient intensity to meet the requirements for livestock forage, wildlife habitat, watershed analysis, recreation development, botanical and ecological studies. The inventory

would include the construction of vegetative type maps and determination of vegetal composition and density. Additional information, such as grazing capacity would be developed later by resource technicians as needed.

The third category relates to use studies of both the existing situation and projected demand. Uses of the desert that have been identified in this section include mining claim and right-of-way inventories; sale and lease analyses; land transactions; range, wildlife, and recreation use studies; and trespass inventory. Derivation of revenues to the Government, and resource production, occur primarily in this section.

The fourth category involves management support studies; again both in terms of the existing situation and projected demands. These items are additional functions necessary for fulfilling the objectives of the Plan. The work elements in this category include studies of transportation, communication, protection and legislative needs and the research and analyses relating to the economic and social profiles, environmental amenities, regional planning, organizational arrangements and information and education required in the planning process.

The fifth category pertains to scientific value and interpretive studies, most of which would be accomplished by universities and outside professional organizations. The information developed in this part would not only contribute to the Plan but would provide the base for BLM educational programs and material for museum uses and training aids for "naturalists".

The sixth category deals with the actual plan formulation. Through the time span of the package a gradual build up of manpower has been

scheduled to coordinate and integrate the mass of resource information. The greatest effort would occur in the fifth year at which time the plan is scheduled to become finalized.

The seventh category is concerned with the program service requirements for actual plan development. This category generally includes overhead, administrative services needed for contracting, clerical requirements and operating costs.

The eighth category in the program estimates does not relate directly to the Plan but rather is concerned with interim management and operations. The major input to this category is the development of a BLM desert ranger force. It also includes related program service requirements. As resource technicians complete assignments on development of the Plan, they would be shifted to operations in preparation of plan implementation. In this way no reduction in personnel would be necessary.

The ninth category is a broad estimate of facility construction which might take place prior to consummation of the Plan. Survey, design and land acquisition, as well as some construction, are considered here for such proposed structures as the Desert Center, Way Stations, and recreation site development.

In calculating cost estimates, all work including contracts was converted to man months. The following average man month cost rates were used:

Bureau Direct	$1000.00
Leave and Fringe	1250.00
Contract	2000.00

The total project cost includes an allowance of 30% to provide for administrative and technical overhead support.

Total Cost Estimates:	California Desert Plan	$10,000,000
	Interim Management & Construction	5,000,000
		$15,000,000

Program Estimates - California Desert Plan

Work Elements	Type of Unit	Total Work Estimate
I. Base Control		
Boundary Determinations Study area, Recreation areas, county, Congress. Dist.	M/M	5
Cadastral & USGS Control Existing & Needed, Evaluation, Priorities	MIL MON M/M	15,000 10,000 50
Maps & Photos	M/M	76
Ownership & Status P.D. Withdrawn, Federal, State, County, Private	ACR M/M	16,000,000 10
ADP (Coding, Systems Design, Programming)	M/M	290
Guidance (Objectives, Standards, Criteria, Assumptions	M/M	50
II. Resource Information Base		
Vegetation Inventory	ACR M/M	16,000,000 246
Soil Survey Selected Areas	ACR M/M	4,500,000 144
Cultural Features Man-Made Structures	ACR M/M	16,000,000 24
Climatic Analysis Precipitation, Weather Patterns, Temperature, Seasons, Humidity	M/M	10
Hydrological Inventory Springs, Wells, Reservoirs, Lakes, Canals, Streams, Rivers, Underground Flood Plains	NUM MIL M/M	800 23,000 72
Watershed Analysis Incl. Erosion Survey	ACR M/M	9,600,000 90
Mineral Inventory Indicated, Potential, Active Areas	ACR M/M	11,000,000 136
Wildlife Habitat Inventory	ACR M/M	11,000,000 80
Fisheries Inventory	MIL M/M	8,000 78
Recreation Inventory	FUN M/M	7,000 152

III. Use Studies (Existing & Projected)			
Mining Claim Inventory	CAS M/M	250,000 282	
R/W Inventory	CAS M/M	2,000 10	
Sale, F.U., Lease Analysis Material, Other Mineral, SLUP, Free Use	CAS M/M	400 10	
Range Use Studies Condition, Trend, Utilization, Class, Season, Capacity	ACR M/M	6,000,000 80	
Wildlife Use Studies Type, Numbers, Areas, Seasons	ACR M/M	16,000,000 90	
Recreation Use Studies Type, Amount, Season, Distribution	ACR M/M	16,000,000 450	
Land Classification & Transact. Disposal, Withdrawals, Exchanges	CAS ACR M/M	8,000 2,500,000 130	
Trespass Inventory Occupancy, R/W, Material, PL 167, Agriculture, Advertising, Range, Fire	CAS M/M	700 30	
IV. Management Support Studies (Existing and Projected)			
Transportation System Roads, Trails, Air Strips, Heliports, Railroads	M/M	50	
Access Needs Inventory	CAS M/M	350 30	
Communication System Survey & Design	M/M	44	
Public Hazards Inventory Abandoned Mines, Dangerous Terrain, Poisonous Plants and Reptiles	NUM M/M	15,000 92	
Protection & Enforcement Analysis Presuppression, Law Enforcement, Search and Rescue	M/M	20	
Legislative Analysis Lands, Resource Use, Enforce- ment, Transportation	M/M	50	
Economic Profile & Analysis Population, Employment, Income Resource Demand & Use, Benefit Analysis	M/M	50	
Social Profile Human Needs, Demands, Environ- mental Stress	M/M	48	
Environmental Amenities Analysis Open Space, Natural Beauty, Air, Water, Land & Noise Pollu- tion, Land Suitability	M/M	40	

Regional Planning Analysis Federal, State, Local	M/M	80
Organizational Analysis	M/M	10
Information & Education Analysis Educational Institution Use and Research, BLM Dissemination	M/M	130
V. Scientific Value & Interpretive Studies		
Geological	ACR M/M	5,000,000 36
Mineralogical	ACR M/M	16,000,000 24
Botanical & Ecological	M/M	48
Archeological & Ethnographical	ACR M/M	11,000,000 194
Paleontological	ACR M/M	11,000,000 36
Indigenous & Rare Species	M/M	50
Historical incl. Site Inventory	M/M	24
VI. Plan Formulation		
Program Coordination, Activity Integration, Use Impacts and Conflict Analysis, External Review, Management Decision, Plan Publication	M/M	200
VII. Program Services		
Executive Direction and Supervision	M/M	100
Administrative Services Procurement, Contracting, Reproduction, Personnel, Programming	M/M	100
Clerical Services	M/M	230
Training & Safety	M/M	50
Equipment, Supplies & Materials Fixed Costs	$Th	

VIII. Interim Management & Operation Activities			
Supervision	M/M	950	
Ranger Force			
Cartographer			
Radio Technician			
Resource Technician			
Clerical & Administrative			
IX. Pre-Plan Construction			
Architectural & Engineering Design	M/M	250	
Desert Center, Way Stations			

PART III: APPENDIX

To satisfy the growing demands on the fragile California Desert environment, we need information on which to develop a comprehensive plan. This part of the report provides supporting data on the need for more research, inventorying, surveys, and analyses--all of this done in a systematic, comprehensive manner so that an operational plan can be developed. It stresses the importance of the Desert's natural resources, outlines the problems in their proper management, and details the information needed for planning. And it identifies the functions and services that the Bureau of Land Management must plan for and provide in its multiple-use management of the Desert.

THE MINERAL RESOURCES

Minerals constitute one of the principal resources of the Desert Area. Production of this resource now amounts to some $160 per year and is expected to reach at least $300 million by 1980. This is the basic value of the raw mineral as it comes from the ground. In final refined or converted form, raw minerals become even more valuable. This mineral production has a multiple effect--a gross economic impact now of some two-thirds of a billion dollars on the nation.

POTENTIAL VALUES

The Desert Area has the State's greatest potential for future mineral production. Several reasons account for this condition: (a) extensive areas of contact or zones between the intrusive granitic rocks and old metamorphic-sedimentary rocks that are often quite favorable environments for the concentration of metallic minerals; and (b) vast areas deeply covered by alluvial fans that completely bury the rock formations within which are ore bodies.

Heretofore, deeply buried ore deposits have been rarely found and explored. But today, with the modern instruments and tools of the geophysicists, the discovery of these ore bodies is no longer a rarity. Until the early 1940's, most mineral discoveries were made by bearded surface=plodding prospectors who would hit upon an outcrop. Today, discoveries are made by geologists and geophysicists who use highly sophisticated, scientific instruments. They either operate from planes, helicopters, or motor vehicles.

Yet with all of the potential present, California has surprisingly declined from pre-eminence as a great metal mining state. This decline is attributed to a lack of modern exploration programs and geophysical surveys. To a considerable extent this lack can be attributed to the problem of title pollution and to the reaction of conservationists concerned with the surface destruction of some mining operations.

PROBLEMS

Broadly speaking, minerals fall into three general categories: leasable, salable, and locatable.

The leasable minerals are administered under the Acts of 1917 and 1920, and include coal, petroleum, oilshale, phosphate, and sodium salts. In the Desert Area, they pose a minimum of administrative problems. The prime consideration in leasing minerals is the effect their mining or removal will have on the environment. Generally speaking, any effects can be controlled by stipulations incorporated into the lease, and field inspections to guarantee that agreements are fullfilled.

The salable minerals include such non-locatable (not subject to mining claim) minerals as sand, gravel, building stone, cinder, crushed rock, and fill material. The administration of these mineral materials can be relatively simple except when they are located on lands already under mining claims. In such instances, the mining claim clouds the title of the land and, in effect prevents the disposal of the salable minerals until the Bureau of Land Management has spent considerable time and effort in validating or invalidating

the claim. Should a mining claim for a locatable mineral be valid, the claimant would of course be entitled to acquire fee title to the land, including the total mineral estate, which would preclude disposal of the salable minerals by the Bureau of Land Management.

The massive number (250,000) of locatable mining claims on the Desert almost entirely blankets those areas containing salable minerals. Only a small percentage of these claims are considered valid, but it is an impossible undertaking for the BLM to attempt to remove the cloud of invalid claims from salable mineral sites in a timely manner. One consequence has been the problem of trespassing on property. This in turn has further complicated mineral resources administration and detracts from the BLM's capability to satisfy legitimate demands of the mineral industry.

The basic mining law of 1872 was geared to the outcropping fissure-type of vein found in the Mother Lode area of California. The fundamental principle of the law is that the locatable minerals are free and subject to location.

Today, mineral discoveries are principally limited to the large, low-grade subsurface type of deposit. Oftentimes there is no surface manifestation of such a deposit, and its discovery is time consuming, laborious, and expensive. Exploring such subsurface deposits requires the work of geologists and engineers whose work is readily discernible to the general public. Individuals or organizations making geophysical

or other types of explorations may be subjected to the harassing or nuisance type of mining claims. To protect themselves aginst such harassment by the opportunist, they have found it necessary to blanket a large area with mining claims in order to proceed with their exploration work and to protect any discoveries they should make. This expensive and illogical procedure has been forced on the legitimate operator and industry. And the need for prediscovery protection has been long recognized.

Title Contamination

Probably the biggest obstacle facing the Bureau in its efforts to build a mineral sales program is title contamination by spurious claims. Over the years, many proposals have been formulated in response to the problem. At no time, however, has there been sufficient responses to any one proposal to result in Congressional legislation or Departmental implementation.

The Desert Area is plagued with an enormous number of mining claims. Most of them--more than 95 percent--are illegal and invalid because of their lack of a mineral discovery. Often, mining claims have been located two or three deep on a given parcel of land--all without a valid discovery. The location of a mining claim on a public domain is the assertion of an interest to and right in land embraced within the boundaries of the claim. To extinguish these illegally-asserted rights in invalid mining claim locations is a costly and time-consuming procedure. Under BLM procedures it is the practice to search out (in county records) every location on a given parcel of land and eliminate by contest procedures

each and every invalid mining claim. This procedure usually starts with evaluating the latest location and going back through the years--peeling off the claims one by one. The BLM needs the authority to recognize California State Law regarding assessment work. The lack of a recording of a 'proof of labor' and an intervening right should constitute abandonment of a mining claim.

A typical example of the harassment type of claim is found at Calico. Immediately after a large mining company started exploration work, large numbers of mining claims were made on land explored by the company. These claims include not only lode locations in the hills, but also placer locations of 160 acres each on the alluvial fan in the valley. In practically every case, these claims are invalid and were located by speculators who wished to capitalize on the company's development. The location of a mining claim, even though invalid, still implies a right in the land. Such locations in many cases may be considered a form of title contamination.

Of the estimated 250,000 mining claims of record in the Desert Area, about 75,000 were located after 1955. Today, some 25,000 are being actively held, probably not more than 500 of them would meet the test of validity. The basic concept of the 1872 mining law that only a discovery will be located is seldom met. Several factors account for this situation. The prime factor is competition for minerals, for land, and for money. In the competition for minerals, when it becomes known that a valuable mineral has been discovered in a given area, people rush in and stake mining claims on all unlocated land. In many instances they even stake claims on top of known locations--often in hope

of creating a claim which will have nuisance value to the valid discovery by blocking access or by creating a claim that can be promoted and sold to the unknowing.

Conflicts in Use

The conflict of legitimate mining operations with other uses of the Desert lands is actually at a ~~very~~ minimum. Such mineral operations will never occupy more than one-quarter of 1 percent of the Desert Area. That vast acreage that is now covered by mining claims is not all mineral land or land used for mining operations. It is the pseudo claims that really conflict with those other uses, such as grazing, timber production, wildlife, urban expansion, and recreation.

Recreation.--Mining and recreation are considered to be in direct conflict, but many instances are found where these two uses of the land are compatible. Today the mining industry is most cognizant of its impact on the environment and the needs of the public. As a result, industry is becoming more responsible and cooperative.

Mining, whether it be in the past or present, has a very strong appeal to people. Among the many examples of present day mining operations that attract tourists by the thousands is the Utah Copper Pit at Bingham Canyon, Utah. Here tourists view a tremendous copper mining pit which terraces the side of a major mountain range. The pit, 2 miles in diameter at the top and as deep as two Empire State Buildings, was created by man, who has removed billions of tons of rock (and ore). Among the old mining operations of the West, dozens today are proving to be tourist meccas and centers of recreation. Park City, Utah, one of America's finest ski areas, is built

around the Old Park City Mines. The lower mine tunnel takes the skier under the mountain and the hoist takes them to the top of the ridge. Aspen, Colorado, an old lead-silver mining camp, is a first-quality ski resort in winter and a nationally known center for the performing arts in summer. The Death Valley National Monument today features the borax mining camps as an important attraction. And as a final example, the old Malakoff Hydraulic Mine is now a California State Park.

Many families while driving down a highway and viewing a parallel desert mountain range will spot an old abandoned mine on the hillside. Their usual reaction is to stop and view the weathered buildings, worn foundations, and mine headframes. They are attracted by the old multi-hued rock dumps which, in many instances, are rockhound delights. When there is such a change in the desert landscape and it attracts people, it may be considered a scenic enrichment. For mining does not always detract from recreation pursuits. It can co-exist with recreation and other resource uses, and in many instances can be considered beneficial to resource management.

Surface Estate.--In the United States when a person qualifies and requests a mineral patent to a mining claim, the patent usually conveys the entire fee including the surface right. In some countries, including Canada, the mining claim includes only the mineral estate.

Such policy has merit for it eliminates the land speculator who is interested primarily in the surface values. The mining industry since has recognized this problem of surface values ever since the American Mining Congress proposed that when a mineral patent is granted, the surface estate should be conveyed at fair market value.

The proposal has considerable merit as it would tend to discourage the land speculator who tries to operate under the guise of the mining laws. When Congress enacted the mining law in 1872, it intended to convey title to the land at about fair market value (the mineral estate being free). If only the mineral estate were patented and the government kept the subordinate surface, considerable long-range benefits would accrue to the public.

Once a mineralized zone is mined out, such as open-pit and/or placer mines, the surface is of no interest to most private individuals, developers, or corporations. On the other hand, a large worked-out mining pit or placer area could have significant values when coupled with adjacent public lands having multiple uses.

The Stock-Raising Homestead Act of December 29, 1916 also separates surface estate from mineral estate. A claimant may locate and work the mineral estate in accordance with mineral laws. And he can enter and occupy as much of the surface as may be required for all purposes reasonably incident to the mining or removal of the mineral

PROPOSED PLANS

Requirements

Any proposed minerals program must benefit the general public as well as the mining industry. Furthermore it must be administratively acceptable to the BLM.

For such a program to be basically beneficial to the public, it must: (a) provide minerals for the general economy of the country; and (b) protect the over-all desert environment.

For such a program to meet the requirements of industry, a minerals program must: (a) respond to the principal of the basic mining law of 1872; and (b) create an environment in which the industry can operate with confidence and free from harassment.

For such a minerals program to be acceptable to the BLM, it must: (a) provide for ease and economy of administration; and (b) be compatible with other resource programs.

To meet all these basic requirements under present laws and Departmental regulations is an absolute impossibility. To retain the basic law of 1872 and meet the general requirements as outlined, some supplemental legislation is required.

With the public's insatiable need for minerals, the basic law of 1872 has sought to encourage the development of mineral resources. The protection of the environment has usually been attempted by the "withdrawal" of the land from prospecting and mineral entry. In most cases, non-mineral land has been withdrawn. The real purpose of these withdrawals often is to protect the land from land promoters and the pseudo miners with their spurious claims. The mining industry is not interested in making mineral location on non-mineral land. It therefore follows, that many withdrawals need never be made in the first place. Seldom are mineral lands withdrawn and only in those limited cases when other values are extremely high.

The basic mining law encourages mining, but the environment that industry operates in is contaminated by harassment from the opportunist and the unscrupulous, who often files spurious invalid mining claims. Combating these invalid claims is so time-consuming and expensive that it often discourages mineral exploration. Many times the Bureau will eliminate invalid mining claims only to have new and equally invalid claims filed immediately after it had decided. The elimination of spurious mining claims is absolutely necessary for the economic management and development of the Desert. Industry partially recognized this problem when it proposed the prospecting claim. This proposal has much merit but it does not materially reduce the cost of land administration.

Another possible approach to this problem is gained by reviewing the history of mining in Saxony Germania during the 1400's. In those days, when a prospector discovered a valuable mineral in the King's land, he applied to the royal mineral administrator for a claim (meir). The discovery was evaluated by the administrator and if found valid, a claim was then and there allowed. There were no spurious or invalid mining claims on the King's domain.

Alternatives

Pilot area.--One possible mineral management plan would be to consider the Desert Area a pilot area for the trial, development, and refinement of a minerals management plan. The Desert Area would be closed to locating claims as it is now practiced. Then examine and

eliminate all the spurious mining claims. As claims are cleaned up, only claimants with valid rights would be issued prospecting permits, based on their exploration plans. Their Permit would not exceed one township, and for a time period not to exceed 3 years, subject to renewal for a like period, if justifiable. The applicants would have to agree to protect the surface environment and areas having high public values. If he discovers any minerals, he would immediately locate his claim on his discovery. His claim would be subject to a timely validity evaluation by a BLM mineral examiner. When the prospecting permit has served its intended purpose and expired, the unlocated land immediately would become open to further application for prospecting. If a mineral patent is granted, it would only convey the mineral estate--not the entire fee title.

Such a mineral management plan would require a special legislation. It would have many advantages:

1. All spurious mining claims would be eliminated. and their relocation would be prohibited.
2. The long-range management cost of the Desert Area would be greatly reduced.
3. Mineral exploration and development would be encouraged. resulting in increased production.
4. Occupancy trespass would be greatly reduced or practically eliminated.
5. Surface and vegetative damage would be minimized.
6. Wildlife environment would be improved.

7. Recreation environment would be greatly improved.

8. The BLM would be able to start a mineral materials sales program of some $1,000,000 per year--over and above the present operations.

9. The economy of the Desert Area would be materially benefited.

10. A prospecting permit system would generate substantial revenue to the Government.

Closing locations.--Another plan would be to classify the entire Desert Area as closed to mineral location without a prospecting permit. Such a move could be explored with the Secretary of the Interior's Office. Without Congressional approval it would undoubtedly raise quite a tempest, but the plan contemplates limiting the right of mineral location only to those who have discovered valuable mineral. This condition is in conformity with Congress' intent when it passed the mining law of 1872. The only rights extinguished would be those attached to that great mass of locators who are so lacking in good faith that they refuse to acknowledge the need to making a discovery before location.

Examing locations.--Another alternative would be to examine immediately all new mineral locations as they are recorded in the county records. Although this approach would be effective, it would be prohibitively expensive. In time, it would to some degree educate the public to the facts of mineral location, but it would never completely discourage the opportunist who lacks good faith.

On numerous occasions it has been proposed that all minerals, including the locatable minerals, be placed under the "Leasing Act." Over the years the mining industry has most vigorously opposed such a move. Any major change in the mining law cannot be accomplished without the cooperation of both government and industry. Because industry's very united vigorous opposition to the leasing of the present locatable minerals it appears that there is no reasonable possibility of this plan being adopted in the near future.

Status quo.--One other alternative is to allow minerals activity in the Desert to remain as is with no additional constraints. Nor would there be innovations conducive to improved minerals management under a program which could be advantageous to industry, and government through increased production and increased taxable revenues.

But without a cooperatively planned BLM-industry minerals management program for the desert, mining and mining claims will continut to be incompatible with other uses and demands for the desert lands and resources. Such a lack of program may well negate those public demands supported by responsible mineral industry leaders to protect and preserve valuable areas of a fragile desert environment.

Impact

If the spurious mining claims in the Desert Area can be eliminated, the Bureau would then be able to build a mineral materials sales program. The demand for such material is growing. With a minimum effort the Bureau could probably sell $1,000,000 worth of mineral materials in the Desert Area. But over the years, it has had to turn down many

applications for the sale of mineral material because the desired area was covered with spurious mining claims that prevented any sales. The lack of budget and mineral personnel precluded work in clearing up these claims.

If a positive mineral management program is adopted for the Desert Area, there is every reason to believe that many new discoveries of ore deposits will be made. Many experts believe there is a good possibility of discovering a major porphyry copper deposit in the Mojave Physiographic province. Even a small operating open pit copper mine would produce some 20 to 30 million dollars per year. It is estimated that the overall rate of mineral production from the Desert Area can be stimulated by some 50 to 100 million dollars, over and above any normal rate under the present conditions.

The Bureau would benefit directly. If a permit system for mineral exploration were adopted, the benefits and savings to industry would be such that the Bureau would be well justified to charge a yearly fee per acre for the prospecting permit. Such a system has the potential of generating substantial returns to the Bureau.

PLANNING

Inventorying

Phase III of the California desert study will require the gathering of detailed minerals resource information from BLM field studies, from studies and data developed by other federal, state and local agencies, and from conferences with the minerals industry. This inventory will identify given mineral areas and can be used to evaluate the relative importance of the areas to a BLM minerals management program, to

industry needs for certain minerals. From the information the BLM can determine the compatibility of potential mineral areas to other types of resource development and uses. Thus, a priority sequence of minerals work can be established by the Bureau when it attempts to carry out the elements of a comprehensive plan of management for the desert. Those mineral areas having the greatest conflicts and values should be investigated first in a comprehensive planning effort.

Minerals information can be gathered for documentation and statistical analysis on a county basis or on the planning unit basis or both. A planning unit is the land area used for inventory and planning purposes in the BLM Planning System Manual (1601). It refers to that land area that the Bureau considers a logical planning and management entity because of distinct topographical boundaries and resource characteristics.

An important part of the BLM minerals inventory and planning activities will be joint efforts with the State Division of Mines and Geology and the mineral industry to evaluate the impact of develping new mineral areas. This work might involve identification of extremely valuable or rare mineral locations, setting aside of these mineral sites to preclude certain incompatible uses from encroaching on the sites making mineral development overly costly to industry or hazardous to other uses, and developing regulatory measures acceptable to industry, local and state governments and the BLM.

Cooperative efforts will also have to be directed toward identification of mining hazards from active and abandoned mining claims and mining operations. And work should be done to determine what can and must be done to restore abandoned exploration and mining sites to

conditions of practical usefulness or reasonable physical attractiveness. In addition, a cooperative assessment is necessary to determine where a desert road system should be located to provide access for the exploration and removal of leasable and salable mineral products without destroying desert environment values and to provide multiple access for such other desert uses as recreation, administration, and fire protection through access for highways and other right-of-way purposes. Road standards will have to be determined for the mainline roads used for hauling of minerals and for the spurs needed for exploration and removal of minerals to mainline roads, when the BLM or other agencies or private industry intends to construct roads in adjoining areas actively being mined or having a potential for mining, and the roads will be heavily traveled. Developing a road system that would satisfy multi-desert uses is imperative to prevent the duplication of road construction efforts, to prevent despoilation of desert vegetation and scenery, and to prevent drainage and soil erosion problems created from unplanned and uncontrolled road locations.

Investigating

To date the mineral resource potential of California, including the Desert Area, has not been adequately explored and evaluated. There has been no government-sponsored resource surveys from the air, no interpretation of air photos on a state-wide scale, and no significant geophysical surveys. Only a fraction of the geologic mapping coverage is on a scale (1:62,500) needed in mining.

Concurrently with the field examination of the mining claim conflicts and the resolution of the title encumbrance, the Bureau should make a complimentary geologic-geophysical survey of the mineral

potential. This survey should be in such detail that it will call attention to potential of the mineral resource and attract private capital in further exploration and development.

This approach to the stimulation of resource development has been used by many agencies and governments, including the United Nations. It has been most successful in many instances, and the economic benefits can be substantial and long lasting. Classic examples of the results of geologic-geophysical programs are found in Canada and in Europe. The geologic-geophysical survey should use the most advanced airborne censors, including those developed by the National Aeronautics and Space Administration, along with the magnetometer, electro-magnetometer, and gamma ray spectrometer. Included in the program should be a computerized exploration evaluation service.

Since the Bureau is not geared to conduct such specialized work with its available expertise, a series of coordinated contractual arrangements could be made to accomplish the program. The program should include the California Division of Mines and Geology, U.S. Geological Survey, University of California Department of Mineral Technology, and National Aeronautics and Space Administration (Earth Resource Division).

THE SCIENTIFIC RESOURCE

The key to many unsolved problems in anthropology, archaeology, and paleontology lies in the vast Desert regions now being considered for development by the BLM. Studies there in man's primitive culture and of fossil animals and plants may yield many of the long-sought answers. For this area is a priceless source of historical and scientific data.

Relics once destroyed, can never be replaced. There are, for instance, hundreds of sites that bear only surface remains. In 90 percent of the cases, the archaeological deposits lack depth and therefore have no protection from relic hunters, mining, road building, and the countless other activities now taking place or planned for the future. Scientific study of such open sites is just as important as that of deep middens (refuse heaps), rock shelters, and similar hidden situations where temporary protection has been afforded.

Some work has been done by universities, museums, and private individuals, but it has been so restricted by lack of funds and time that the Desert regions have only been scratched in terms of adequate research. Most work to date has been done by U.S. National Park Service in areas such as Death Valley, Joshua Tree National Monument, and the Anza-Borrego Desert. Work on BLM lands has been done only by private individuals or institutions who have a particular research problem and organize help on a volunteer or class basis.

ARCHAEOLOGY

The archaeological status of the Desert Area is particularly critical. Some highly valuable archaeological sites, as well as whole areas have already been damaged or destroyed. This destruction has

come about as a result of such activities as roadbuilding, mining, and urban development. Most tragic, however, has been the destruction of archaeological remains from the pressure of people flocking to the desert in pursuit of leisure-time activities. In many instances, "people pressure" has resulted in the illegal removal and defacement of archaeological evidence. Motorcycle racing, uncontrolled camping, dune buggy racing, hobbyists collecting rocks and minerals, mining prospectors, and hunters are all, at an ever-increasing rate, destroying these valuable sources of scientific study of our past.

Probably the most important single factor has been the activity of the pot hunter or relic collector. These are people who illegally remove, collect, and deface archaeological materials. Some, are local residents. The majority are people who will and have traveled hundreds of miles to gather arrowheads and pots for removal to their private homes. Removal of these items is illegal. Federal and State laws have been enacted to protect antiquities, but to date, no really effective enforcement program has been implemented.

The Bureau should assume the leadership and responsibility in the preservation of our archaeological heritage in its development of the desert. The authority to perform these duties is clearly stated in the BLM Manual, Section 6231.03, titled "Management of Antiquities." Section 6231.04 clearly defines the responsibility and also states: "Lands containing antiquities will be managed so that full public benefits will be realized." Section 6231.04, titled "Inventory," states in part: "A thorough, continuing inventory will be made of archaeological, historical, and paleontological sites located on lands administered by the Bureau." To date, there has been no coordinated antiquities management plan for BLM-administered lands in the desert.

We realize that the demands upon the BLM for other uses in the Desert Area and a planned "multiple use" concept must sometimes necessarily go into, and disturb, archaeological remains. When such areas must be so utilized, however, they should be surveyed well in advance of development so that archaeological materials can be gathered and recorded by professional archaeologists.

The lack of existing archaeological data on BLM lands is a significant problem. About 90 percent of the Desert Area has never been systematically surveyed by competent archaeologists. Therefore, thousands of sites exist which have never been recorded. Present BLM policy provides for the recording of archaeological sites if they are found by Bureau personnel in the field, but no effective use has been made of this system. Forms are provided to each BLM District Office for use in recording sites, but to date, only an insignificant number of forms have been filled out and turned in. Archaeological reconnaissance, however, cannot be expected of the normal BLM employee. Most archaeological sites can be completely missed by an untrained employee. Unless some very striking features remained, such as petroglyphs, whole pots and arrowheads, most sites would remain completely obscure and never be noticed by an untrained eye. Important sites to the archaeologist are not necessarily the late sites with such obvious remains. The recognition of early man sites generally requires the trained eye of a professional

PALEONTOLOGY

The paleontology of the desert region is commensurate in importance with the archaeological remains. Some of the most important deposits in America exist in the California Desert. All Federal and State

Antiquities Laws, as well as the National Park Service and BLM regulations, require that these deposits be protected.

The Desert has been of prime paleontological interest ever since the 1920's when J. C. Merriam, of the University of California, Berkeley, began reporting on fossil mammals from deposits in the " Mud Hills" northeast of Barstow. Other members of the University faculty, including those at Riverside, have maintained a strong interest in the paleontology of the desert. M. O. Woodburne of the Department of Geological Sciences, at Riverside, is probably the individual now most directly concerned with this area. Others include R. H. Tedford, formerly of U.C. at Riverside, now of the American Museum of Natural History, New York; and G. E. Lewis, U.S. Geological Survey, Denver, Colorado.

The deposits near Barstow (Barstow Formation) are probably some of the most important in North America. The fossil vertebrates they contain provide the basis for the Barstovian North American Land Mammal Age, the fundamental late Miocene unit of non-marine faunel correlation in this continent. Other areas in the Desert demonstrate that localities of paleontological interest are widespread in this region. These range in time from early Miocene to Pleistocene and provide crucial evidence as to the historical mammalian evolution, paleoecology and paleoclimatology of the region. Two of these localities, Dagget and South Cady Mountains, ~~illustrate the fact~~ suggest that the Mojave is still in a pioneering stage of development relative to fossil mammals. These sites are of middle and early Miocene age, respectively, and were discovered in the mid-1960's. Before their discovery, faunas older than late Miocene (Barstow equivalent) were almost unknown in the Mojave. This

finding has lead some students to the unwarranted generalization that pre-late Miocene sediments did not exist on the Mojave.

HERPETOLOGY

The growing public interest in herpetology is evidenced by the many snake and lizard collectors who roam the Desert. In some parts, they actually outnumber the species. This form of people pressure has an adverse effect on herpetological habitat. Other uses of the Desert contribute the damage being done each day--urban encroachment, intensive recreation use (picnic sites, off-road vehicular activity, recreation home-site construction), road building, and mineral explorations.

The BLM has done only a minimum in planning and management to protect the variety of reptiles and amphibians inhabiting the Desert. To protect the habitat of those rare or endangered species, immediate plans must be developed, or these species may soon face extinction. Some species are so restricted in their habitat that they are not compatible with other uses of the Desert. It may be necessary to establish sanctuaries to preserve these species.

An endangered species in the higher desert is the Black toad (Bufo boreas exsul) in Inyo County. In the lower desert, the desert tortoise (Gopherus agassizi) has been accorded the status of a protected species. The status of the Armogosa toad and the Gila Monster are undetermined. The herpetological composition of the lower desert is especially valuable because it holds many peripheral life found primarily in Baja California, Mexico. The peripheral species found in the California Desert include:

Leaf toed Gecko (Phyllodactylus xanti)

Granite night lizard (Xantusia henshawi)

Granite spiny lizard (Sceloporus orcutti)

Small scaled lizard (Urosaurus microscutatus)

Banded rock lizard (Streptosaurus mearnsi)

Desert rosy boa (Lichanura trivirgata)

Desert Patch-nosed snake (Salvadora hexalepis hexalepis)

California lyre snake (Trimorphodon vandenburghi)

Red diamond rattlesnake (Crotalus ruber)

EDUCATION

Scores of universities and colleges use the California Desert for a variety of historical, biological, and natural resources studies. But neither the State nor the BLM has developed a system for identifying and preserving the areas that will be required for these educational and research activities. Nor have guidelines been developed for relating educational program uses with other resource management programs. If these educational needs are not identified in the near future, they will be lost forever. The fragile nature of the Desert is a major factor. Another is encroachment from other incompatible resource uses and development.

The BLM and the State Coordinating Council for Higher Education should jointly undertake an inventory of research and study areas that are needed by State institutions of higher learning. They should determine the capabilities of the areas to support one or more research program. They should look into the possibility of institutions sharing the use of unique areas that are limited in availability. And they should develop the controls necessary to protect and preserve these areas.

MAJOR FINDINGS

During the course of our initial archaeological and paleontological research in the Desert, we assembled as many records as time permitted on important sites, and evaluated the problems in four priority areas.

Archaeological Sites

Many sites records are on file at various institutions and museums. The following is a list of the sources and the number of records of sites acquired from each.

UCLA - Archaeological Survey Office	174
BLM - Riverside District	10
San Diego Museum of Man	353
San Bernardino County Museum	137
University of California, Riverside	0
Pacific Coast Archaeological Society	5
Bowers Museum - Santa Ana	5
University of California, Berkeley	300
Personal Communication	25
Survey in the field	39
Total	1,048

We collected site records for the 19 [redacted] recreation [redacted] listed in the 1968 Calif. desert study [redacted]

We selected four [redacted] areas as tests for evaluating the problems that would be evident in future work. Several days were spent in each locality with a crew consisting of from 3 to 10 persons.

°CALICO [redacted]. A heavily used "people pressure" area close into dense population centers. As expected, we found many examples of

destruction and vandalism. Petroglyphs at Inscription Canyon, for instance, had been defaced and even some pieces removed. Whole portions of basic basalt had been chiseled and knocked away from their matrix and removed. Elsewhere, desert roads lead directly to and through archaeological deposits.

Paleontological deposits are being removed at and around Rainbow Canyon. Murphy's Well, Black Canyon, Joshua View, Coyote Lake (dry), and Tin Can Alley (appropriately named) showed disturbances. The famous "Early Man" dig near Calico will be within a few miles of one of the BLM's proposed campsites.

°EASTERN MOJAVE ([redacted]): Typical "High Desert" area. We camped at "Hole in the Wall" and surveyed the immediate area and country to the south and east. The hole in the wall is a glaring example of sites already destroyed. Two rock shelters and accompanying midden (refuse heaps) have been totally vandalized, with only a few scattered metate fragments and an occasional sherd (piece of broken earthenware) left to indicate that this was once an archaeological site.

In this area we also discovered vandalism to petroglyphs. The accompanying warning signs had been shot up to such a degree that the Federal law prohibiting their disturbance could no longer be read. One large site in this area with possible midden depth was cut through by an existing desert road. Two rockshelters revealed pot hunter activity along with the usual beer cans and debris.

°IMPERIAL SAND HILLS ([redacted]); This is a typical "Low Desert" region highlighted by one of the largest stretches of sand dunes in the world. Besides the obvious "dune buggy" activity, we

observed evidence of sites being destroyed by camping and mining activities. We discovered a series of sites on a low sand and gravel ridge which extends about 30 miles from Mammoth Wash in the north to the Mexican Border in the south. The sites are all being systematically destroyed by gravel mining up and down the East Highline Canal. These sites are very important to our understanding of the archaeological picture in the southeastern portion of the State. Malcolm Rogers mentions two ot these sites in his reports some 30 years ago. They appear to be primarily surface sites and should be recorded and collected immediately before all are lost to the bulldozer.

°YUHA DESERT: An important archaeological area near the dense population areas around San Diego, it is well known and favorite spot for pot hunters. During the survey a large site was discovered at Yuha Well where the phase 1 portion of the Desert Study prpposes a large recreation and campsite area. In this area also are examples of the rare intaglios created by the former Indian inhabitants. One set of these intaglios is presently "protected" by posts and a metal cable which is meant to keep out vehicles. Intaglios, besides being rare, are one of the most fragile archaeological features known and should have more adequate protection. Some unthinking citizens visiting the spot could walk out on the area and totally destroy the figures with several well-aimed boot trails. It is also tempting for vandals to "add their own impressions" to the area as is evident with petroglyphs.

Paleontological Sites

We also investigated but not intensively analyzed paleontological areas that need additional study. Approximately 400 sections in 44 townships in the California Desert are areas known to contain fossil deposits.

PROPOSED PLANS

The archaeological program suggested by this report is designed to tell three basic needs: critical development, priority development, and orderly progress and continuation.

Critical Development

Certain areas of BLM land are at this very moment being consumed. by the building of roads and campsites, the leasing of land for grazing and mining, and the unrestricted, uncontrolled use of federal lands for recreation and mining exploration and production. As a consequence, archaeological resources are being destroyed. These areas should be attended to immediately with whatever means are available on an emergency basis:

- All petroglyph and pictograph sites that are available to the public by maintained access (dirt) roads, especially those indicated on existing travel maps, USGS maps, etc. Inscription Canyon (Calico), Black Canyon (Calico), Corn Springs (Chuckwalla), and Grass Canyon (Eastern Mojave) are excellent examples.
- All campsites and roads that are being constructed or are proposed for construction in the near future and the areas surrounding them. Corn Springs petroglyphs, for instance,

should be immediately recorded and photographed before further vandalism occurs. The area immediately surrounding the campground should be surveyed for archaeological sites before a campsite attracts hundreds of more people to the Canyon. A minimum of at least 1 mile in every direction from the site should be covered to insure identification and recordation. Some campers will roam further than this radius, but most of the damage will be done within this area. The areas around Wylie Well and Coon Hollow (Chuckwalla), where campsites and recreation areas are being constructed, should be surveyed at once. The area of Wildhorse Canyon in Eastern Mojave where a new road [redacted] is Planned should be looked at immediately. The existing jeep trail (the approximate route of the new road) already cuts through a known recorded archaeological site (UCLA--AS #366). Further road work will destroy some of the midden and the added traffic over this 11 miles afforded by the new road will further endanger six archaeological sites in the entire area. This site should be tested and the whole Canyon surveyed immediately. The access road [redacted] Planned in the Tufa Pinnacles area is another that should be surveyed soon.

*All areas around existing campsites and heavily used areas. Hole in the Wall (Eastern Mojave), Owl Canyon (Calico), Rainbow Canyon (Calico), Mammoth Wash (Imperial Sand Hills), and Tin Can Alley (Calico) being specific examples.

•All archaeological areas being destroyed. The sites [redacted] exist along the western side of Imperial Sand Hills near the East Highline Canal. These sites are being obliterated by gravel mining activity. Bulldozers are moving the sand and gravel hills which contain the raw materials for the gravel industry. Many sites are endangered and some have already been totally destroyed.

•Immediate and more adequate protection for the fragile Yuha Desert Intaglios and any others in similar circumstances. Parts of the intaglios have been destroyed by the tracks.

Archaeological reconnaissance should generally be conducted well ahead of planned activities. The occasion may arise where an archaeological site, endangered by development, would be important enough to cause the changing of plans so that it may be preserved. Surveys performed well in advance could result in the saving of considerable money in the planning and designing stages of other activities.

Priority Development

Priority development encompasses activities that should be started as soon as possible. These projects cannot wait for planning to be completed. The most important ones are:

•A systematic and continuing survey of the 19 [redacted] areas listed in the 1968 California Desert Study [redacted]. should be started as soon as possible and should be part of the next 5-year accomplishments.

•Completion of the accumulation of information on known sites. These records should be standardized so that they are all uniform. The records should be expanded to include all BLM lands in the Desert Study Area, and should be kept current.

•In those areas of known or suspected archaeological deposits, contract activities, such as road building, should be included in provisions that allows the BLM to conduct an archaeological investigation during the life of the contract. All areas should be checked in the planning stage before specific project contracts are awarded and access routes are constructed. The costs of archaeological survey testing, and salvage, should be considered a part of the construction costs for the project.

•All areas now in the planning stage should be surveyed.

•Liaison with other activities in the Desert should be maintained with special attention given to the mining industry. There is no provision now for protecting sites which could be destroyed by mining activities, exploratory activities, and exploratory access roads that continuously are bulldozed without regard for archaeological remains. At least in those areas where the BLM intends to dispose of salable and leasable minerals, mining should not proceed without the BLM knowing whether archaeological resources are in jeopardy; and, if so, without taking proper steps for either inventory and record the resources or protecting the resource from encroachment.

•Liaison with Federal, State, and County road departments should be developed. Certain roads can be constructed on BLM lands without notice to BLM and are a constant threat to archaeological resources. BLM should also perform the necessary archaeological investigation before construction of any road, bridge, canal, pipeline, transmission line, and dam on public lands in the desert.

•Some important archaeological sites and areas should be set aside permanently for future scientific study. Archaeological techniques of excavation and dating, unknown to us today, will be developed in the future and these reserved sites or areas would be very important.

•A public relations and educational program is needed to make the public aware of archaeological resources and their values. Building respect for irreplaceable archaeological remains can become a great deterrent in the prevention of vandalism and destruction.

•The State Office of the Bureau of Land Management should establish an archaeologist position as soon as possible. This individual would participate in the entire planning and development program as well as accomplish the public relations and interpretive work.

•As more and more recreational development occurs on BLM lands, additional people will be required for protective and recreational purposes.

Continuing Development

The Bureau is charged with the following responsibility: "A thorough, continuing inventory will be made of archaeological, historical, and paleontological sites located on lands administered by the Bureau" (BLM Manual Section 6231.1), "Management of Antiquities.") Plans for the eventual archaeological survey of all BLM lands should be formulated. But this work should only be done after work on the 19 recreation areas has been completed.

In planning roads and campsites, we should not lead the public directly to archaeological sites. Inscription Canyon in the Calico area is an excellent example. The present county road leading to the petroglyph site takes the visitor directly to the center of the site. The public may drive within a few feet of the petroglyphs. Trash barrels are provided--saying in essence, "Stop here and picnic." Visitors have inscribed their own initials and choice remarks, sometimes directly over and obliterating the originals. Some sections of rock have been actually removed. The area is not adequately posted with antiquities signs.

A partial solution to protection would be to have the access road and "picnic area" lead to a spot somewhere away from the site itself. Just a short 1/4 mile south of the petroglyphs themselves is an excellent picnic spot which would require the public to walk a short distance to view the petroglyphs. A path or indicated path, well posted with antiquities signs, should be developed.

Special Problems

Protecting herpetological habitat is considered a special problem. To determine which species should be protected, the Bureau should contact herpetologists at universities and natural museums in the State. The BLM should investigate the establishment of sanctuaries to protect species that have restricted habitat. It should develop an educational program to protect the users of the desert against the potential hazards of poisonous species in the Desert.

To relieve some of the pressure exerted by pot hunters, certain sites in the desert area could be opened to the public for digging.

Archaeologists rarely find it necessary to excavate 100 percent of any given midden to gain an adequate sample of the remains. Some selected sites could be reserved, after scientific excavation, for amateur groups and clubs, and school classes, who would be allowed to dig in specific places. Some degree of professional supervision would be required. Only recognized and qualified archaeologists should be allowed to excavate and only after approval from the Office of the Secretary of the Interior.

Benefits

The benefits to be derived from a sound scientific study program for the desert is the preservation of irreplaceable resources such as archaeological and paleontological materials which can be viewed and studied by thousands of scientists, educators, and students in the future. Preservation here is defined as the identification, recording for posterity, and in some instances, setting aside from encroachment those sites and areas that have value for archaeological, paleontological, ecological and resource study purposes. Such value cannot always be quantified, but must be recognized if man is to further his knowledge of historical and ecological successions, and his knowledge of natural resources, i.e., how he affects natural resources and how they in turn affect him.

THE WATERSHED RESOURCES

A watershed is defined as "the line of separation between two contiguous drainage valleys and/or the entire land surface from which a water channel receives its supply of water." This definition applied to the California Desert is correct inasmuch as the line of separation and entire land surface can be identified. But, the inference to water does not apply to much of the 16,000,000 acres within the Desert Study Area since normal precipitation is too slight to produce surface water runoff.

The Desert Study Area is part of two hydrologic study areas: South Lahontan and the Colorado Desert. Each of the subregions is subdivided into such smaller watersheds as the Colorado River, Mojave River, and Amargosa River drainages. The largest of these drainages is in excess of 147 miles long and 32 miles wide, and the smaller closed basin watersheds measure 30 miles long by 15 miles wide.

Other than the Colorado River which borders the California Desert on the east, only two major streams are found here. The Mojave has a drainage area of about 714 square miles. It flows north and northeastward from the San Bernardino Mountains through the towns of Victorville and Barstow and disappears underground for most of its 147 mile length to its final destination at Soda Lake and Silver Lake. The Amargosa River enters the east boundary from Nevada and ends in Death Valley. Water appears at the surface of the river bed only sporadically and for short duration after periods of exceptionally heavy storms or cloudbursts.

Actually, the Desert consists of many large and small watersheds comprising two major groups by virtue of geographical location. One

group covering about 2.5 million acres is tributary to the Colorado River. The second group consisting of 13.5 million acres comprises large individual or multiple watersheds of the closed basin type. It is wholly contained within the Desert confines. Drainages usually ending in broad, flat valleys or flood plains, most of which seldom experience flowing or standing water, except during period of excessive rainfall.

The most common conception of a desert watershed is one of nearly level or undulating topography with vast expanses of unvegetated sands. Such is not the case in the California Desert, although there are several such, but relatively small, dune areas in scattered locations. Actually, elevations in the Desert range from below sea level to mountain ranges in excess of 8,000 feet elevation. In fact, 60 percent of the Desert Area is rough and mountainous and only 40 percent gently sloping or nearly level.

VEGETATION COVER

Species

Ninety percent of the desert soils support some type of vegetation of various species and density. This vegetation, however sparse, helps to stabilize the fragile soils from occasional cloud bursts or frequent strong winds.

The two dominant species found throughout most of the Desert Area are creosote bush (Larrea tridentata) and bur sage (Franseria dumosa). Both are low, slow-growing shrubs 1 to 6 feet tall and are easily destroyed by any kind of mechanical disturbance. Interspersed among these and other shrub species on the desert floors are many annual forbs, such as desert sand-verbena (Abronia villosa), filaree (Erodium

cicutarium), coreopsis (Coreopsis spp.), fiddleneck (Amsinkia spp.), buckwheat (Eriogonum spp.), and lupine (Lupinus spp.).

Annual and perennial grasses such as three awn (Aristida spp.) and galleta grass (Hilaria rigida) are also found at lower elevations in association with brush and forbs. There they have adapted to specific soil types and climate. Mountain ranges at higher elevations, where soils are sufficiently deep, support excellent stands of perennial grasses, such as black grama (Bouteloua eriopoda) along with other shrub species such as hop sage (Grayia spinosa), winter fat (Eurotia lanata), and spiney mendora (Mendora spinescens). Many sites above the 2,500-foot elevation have thick stands of Joshua trees; stands of mesquite and Palo Verde occupy the lower elevations and dry wash drainages.

Damage

Actual destruction of the vegetative cover is occurring generally over all the Desert areas. Most of the areas affected are small, but the degree of damage is accelerating in direct proportion to the many uses being made of the Desert. The primary conflicts are those uses that destroy the vegetative cover or destroy a stable soil mantle. These uses include off-road vehicles, unregulated livestock operations, unregulated vegetation harvest (amateur and commercial plant collections), mineral explorations, and denudation caused by unplanned road construction. Soil compaction by people or vehicles around desert plants could injure vegetation. Compaction decreases the water infiltration rate, thus increasing the already droughty conditions [redacted]

Desert vegetation may be subject to damage by pollution. The University of California at Riverside has reported that "there is a potential danger that air pollution may be causing damage to vegetation in the desert."

During an initial inventory of vehicle use areas, we identified 22 separate sites covering 134,000 acres and about 940 miles of trails. Owing to limited number of BLM field personnel, control and management of the vehicle use sites is not possible at the level that would prevent vegetative and soil surface damage. These limitations also hamper us in gathering more data on losses in site productivity (both vegetation and soil). Until the proposed watershed rating inventory is completed, the BLM will not have an adequate data base from which to make the proper decisions on watershed protection.

CURRENT ANALYSIS

At least six agencies, either Federal or State, have made hydrologic studies of all or portions of the Desert Area. They include the Department of Commerce, Department of the Army, Soil Conservation Service, Bureau of Reclamation, Geological Survey, and the California Division of Water Resources. In addition, several universities are studying subjects that relate to hydrology, such as vegetative reproduction and infiltration rates.

The Riverside and Bakersfield District Offices of the BLM have a minimum watershed staff whose time is mainly devoted to planning and supervision of range improvements. The accelerated use of the

desert by potentially damaging uses has far exceeded the two Districts' capability to analyze the watershed problems and cope with them.

Flood Potential

The potential danger to life and limb is not readily apparent to the casual visitor of the Desert. Severe thunderstorms, although infrequent, can occur at any time and can be very violent and cause floods. These destructive floods will vary from area to area but certain canyons are more likely to have them than others. And the relative safety of different parts of the terrain below a canyon mouth varies considerably. The various degrees of hazard on different sites, and the factors that determine them, should be considered especially in planning permanent and semi-permanent installations or use areas.

Soil Erosion

Both low rainfall and extreme temperatures restrict the ability of the Desert to produce sufficient density of vegetation that would prevent severe erosion. And low rainfall excludes any chance of increasing water yields for irrigation or domestic use. But probably very little can be done to increase water yield. Some additional water yield might be obtained by removal and control of phreatophytes along the Mojave and Colorado Rivers.

Maximum plant cover and good erosion control could substantially reduce annual damage to automobiles traveling the desert. Annual damage to automobiles traveling the Desert has been estimated at $12 million annually

Available Data

Some information is available on those resources needed for general watershed information.

The U.S. Bureau of Reclamation Region 3, has issued interim reports on the Mojave River Basin, Chuckwalla Valley, Amargosa project (Nevada-California), Indian Wells and Searles Valley, Morongo-Yucca-Upper Coachella Valley, and Borrego Valley, California. The reports include information on ground water basins, existing and potential arable acres, hydrological studies with climatological and hydrological data that appraise the surface and ground water capabilities, geology, and potential for future development.

The U.S. Army Quartermaster Research and Development Command has published "The Study of Desert Surface Conditions." It classifies the Desert Area into the following types: (1) playas; (2) desert flats; (3) bedrock fields (three categories); (4) regions bordering through-flowing streams; (5) alluvial fans and bajadas; (6) dunes; (7) dry washes; (8) badlands; (9) volcanic cones and fields; and (10) desert mountains.

The U.S. Army's Natick Laboratories, Natick, Mass. has issued a report "Sequential Study of Desert Flooding in the White Mountains of California and Nevada." The investigation was a follow-up to a similar study conducted in 1956-57. In the earlier study, it found that three physiographic characteristics influencing flooding behavior in the Desert stream system: (1) Trunk Canyon profiles; (2) amount of debris on floor of trunk canyon; and (3) width of lower canyon and canyon mouth. The report concludes that the most dangerous

canyons are steep, narrow, and floored with 5 to 15 feet of unconsolidated debris. The area of greatest flooding danger on a desert alluvial fan is a radial zone extending from the apex toward the margin and flanking and including the active channel. The upper and lower thirds of the fan are classified as moderately dangerous; the middle third is subject to only slight flood danger.

Some of the material presented in this study could be extrapolated and applied to the mountain ranges within the Desert Study Area. It could be used to insure that the safest sites are used in development of campsites and access roads where recreation pressure requires such construction in the narrow canyons.

Precipitation.---The U.S. Environmental Science Services Administration has 45 precipitation recording stations at various locations throughout the study area. Climatic data are available for the years 1931 to date. The data are given on a monthly and yearly average basis. The USGS has 14 other rain gauges scattered throughout the desert. Some stations have continuous records over a 30-year period. Generally, average annual precipitation at lower elevations ranges from 2 to 4 inches; higher elevation recordings in the Desert interior register averages of 8 inches annually.

The publication "Probability of Selected Precipitation Amount--T 8 (October 1967), University of Nevada" has information on four desert stations: Barstow, Indio, Brawley, and Blythe. It tries to predict precipitation patterns on the basis of the patterns occurring during the 30-year period from 1931 to 1960.

The U.S. Weather Bureau has released a isohyetal map of the desert area. It is adequate for planning purposes and for project development. The U.S. Geologic Survey in cooperation with the BLM Riverside and Bakersfield District offices has 14 recording rain gauges located in areas on the desert that are not covered by the regular weather stations. This existing additional network should fill in the necessary information gaps needed for management and rehabilitation measures.

Ground Water:--The U.S. Geological Survey has logged nearly all known wells in the Desert and has tabulated them by location, date, owner, year completed, altitude, depth, diameter, yield, chemical analysis, use of water and depth to water below ground level.

The number of wells tabulated to date exceeds 3,500 and provides a good picture of depths to water in all of the valley areas. Since most of the wells measured are for domestic use only, maximum ground water supplies available cannot be determined now. The data logged indicates that domestic water can be reached at an average range of depths of 50 to 250 feet. Wells in large drainage basins and those along major channels commonly are less than 100 feet in depth, with water levels often standing around 50 feet. Those wells in smaller drainages and farther from either active or static drainages are logged up to 1,400 feet in depth. Generally, the relatively few irrigation wells logged produce in the range of 800 to 1,400 gallons per minute. Since precipitation is so low, recharge of underground

water is limited. And even slight increases in number of irrigation wells will readily deplete the recharge and result in lowered water tables throughout individual basins.

Intensive and extensive inventories of ground water location, depths, amounts and chemical analysis have been made by the U.S. Geological Survey and the U.S. Bureau of Reclamation. This data need to be summarized and put in a form that can be usable for BLM planning and development purposes. The inventories are scattered in many publications at this time.

Surface Water:--The U.S. Geological Survey recently completed gross estimates of water yield for the Desert Area. The figures may be used where gross water yields are needed, but the data should not be used to design structures or land treatment measures. Most of the water yield is used on site, either by evaporation or transpiration by plants. Ground water recharge is very low because of the low amounts of precipitation and high evaporation rates. [redacted] Because of the low rainfall, water yield improvement through overland or underground flow would not be feasible.

Flood Damage:--The Army Corps of Engineers and the Soil Conservation Service will be issuing a flood damage report for each hydrologic subunit during FY 1970. This report is planned as a part of the "Implementation of the California Water Plan," California Department of Water Resources Bulletin No. 160-66. It will show the expected 100-year damage and the average annual damage.

This information will be of some assistance to the BLM for planning purposes as it should identify some flood problem areas on BLM desert lands.

The below average runoff and sediment yields do not take into consideration the occasionally devastating cloudbursts occurring in the Desert. Certainly without industrial development, intensively developed recreation sites, right-of-way construction, or thickly urbanized areas present dollar damage to public land improvements would remain minimal over most of the Desert Area. Measurable damage occurring during these storms is to highways and bridges and railroad tracks. Under conditions of intensive development, catastrophic flows of silt and water would periodically result at many locations.

Run-off:--Mountains in higher precipitation belts around the Desert perimeter do provide some runoff which reaches the Desert floor. Such a watershed is that of the headwaters of the Mojave River in the San Bernardino Mountains (table 1). Winter snows and rains in this range average 25-plus inches annually and provide average rates of runoff at the base of the mountains of 31,700 acre feet annually. With distribution ditches this amount if sufficient to maintain 20,000 acres of irrigated cropland along the flood plain of the Mojave River for a distance of 66 miles. Occasional above average snow packs, early thaws, and heavy rains combine to swell the tributaries and flood the plains and towns as far distant as Barstow.

To contain the occasional flood waters and to provide for a longer time period of distribution of available water, the Bureau of Reclamation has studied the Mojave River flow. Present plans propose a dam to be located above Victorville for water storage. Capacity of the proposed reservoir is 125,000 acre feet which has been determined to be sufficient for flood protection and controlled release for irrigated acreage.

Sedimentation:--Records of sedimentation accompanying water runoff are available at only one station in the Desert. These records are a portion of the Mojave River study and are not representative of the sedimentation occurring under the more average conditions prevailing on the vast acreage of the more typically desert climate.

The most reliable method of determing sediment yield from the desert watersheds is the PSIAC system presented by the Water Management Committee (October 1968). This system indicates a range of .2 to .5 of an acre foot of sediment from each square mile of area annually. As a matter of comparison, .2 of an acre foot equals approximately 323 cubic yards, or .0004 of an inch of soil from one square mile annually. This is a very low sediment yield. Low rainfall and very porous soils such as exist here result in a low sediment yield class.

The sedimentation rate is not at all indicative of the massive erosion that occurs during a cloudburst, but does indicate the general wind and water erosion movement.

Ground Surface:--The character of the ground surface is of basic importance to the land manager. The Quartermaster Research and Development Command's Environmental Protection Research Division has published some excellent information on the California Desert Study area. A small scale map included in the Technical Report EP-53, "A Study of Desert Surface Conditions" (April 1957) shows playas, desert flats, bedrock fields, alluvial fans, sand dunes, badlands, volcanic and desert mountains by geological type (granitic, volcanic, etc.).

Vegetation:--An extensive vegetation map is available at the BLM Riverside District, but shows only three or four of the major plant species. It is adequate for general information but not specific enough for watershed planning purposes or for specific species, such as locations of rare plants including the Washington fan palm, or an exceptionally large grove of ironwood trees. A detailed vegetation survey on 1,500,000 acres in the Lanfair-New York and Providence area is available at the district office. Information on specific annual plants was not gathered and will need to be obtained in future inventories.

PROPOSED PLANS

Collection of needed basic watershed data and evaluation of the effects different uses have on the desert watersheds will aid the BLM in making better management decisions. Runoff and sedimentation now have little economical effect on uses in the Desert--mainly because of the lack of capitalized improvements. But with the increased demands being made for more services and facilities in the

Desert, capitalized improvements must be made. Proper location of development areas, away from flood plains, would save on flood damage to structures. Dollar values that can be saved would be the replacement value of the improvements--not to mention possible human lives.

With the development of an adequate watershed data base and rating system, the BLM can anticipate and assess the effect of various uses of the desert and take adequate steps to make these uses compatible with protection of the Desert landscape and environment. Identification of the different rates of site productivity loss will, for example, help us concentrate our manpower and funds on those areas that need immediate attention.

Proper location of BLM facilities such as way stations, access roads and campgrounds would reduce or prevent any loss that could occur by flash floods. The addition of a hydrologist on a District staff would provide the expertise needed to evaluate potential locations.

Inventory

Watersheds:--An inventory is needed to identify and quantify watersheds in relationship to their site productivity and erosion rate. The inventory effort will serve to establish priorities for intensive analysis of watersheds or project areas.

Vegetation:--Preserving, enhancing, and developing esthetic values provided by nature (vegetation) may well be one of our primary changes in the desert area. Broad, extensive vegetative maps exist but are not in sufficient detail for intensive multiple use planning

and management decisions. A detailed vegetation inventory would give the Bureau a more intelligent base upon which to make management decisions.

Ground Water:--The present methods used to locate underground water is not completely satisfactory. New methods need to be explored, such as seismographic studies. A cooperative study should be started with the U.S. Geological Survey on developing a method that would locate small sources of ground water supplies.

Analysis

Watersheds:--The watershed rating system, consisting of five phases, has been developed by the BLM as a result of the influence of PPBS (Planning, Programing, Budgeting System) and management's need to insure that watershed investments are being made in the higher priority areas to meet Bureau objectives. The initial inventory work will rank watersheds against a common criteria to establish those which should be given priority for intensive analysis. This work is in two steps:

Step 1: inventory of physical data and establishing a watershed rating based on three primary elements; (1) rate of erosion on productive lands, (2) productivity of the land, and (3) the amount of productive land subject to erosion in the watershed.

Step 2: consideration of the non-physical factors which influence the need for early treatment of watersheds. Work is needed to (1) curb offsite damage, (2) improve water yield, (3) develop livestock forage, (4) enhance community welfare needs, or (5) solve resource management problems.

Vegetation:--The need for an intensive gegetative survey of the Desert Area is becoming more and more critical as use of the desert

increases. Rare species such as the Crucifixion Thorn (Holocantha emoryi), California fan palm (Washington filifera), Joshua tree (Yucca breviofolia, jaegeriana), Ironwood (Olneya tesota). smoke tree (Dalea spinosa), desert holly (Atriplex hymenelytra), and many other plants--trees, shrubs, perennials and annuals--need to be identified as to location, extent and condition.

Exceptional stands of the various vegetation types should be noted. An example of this would be the creosote bush stand on the western slopes of the Imperial Sand Dunes on either side of California State Route 78. The huge size, upwards of 10 feet, is unusual and must be where this particular species reaches its arboreal climax.

The saguaro cactus (Carnegiea gigantea) is a rare plant in California. There are only a few places where this cactus has crossed the Colorado River, and every effort should be made to protect these specimens. Two locations are known at this time--10 miles north of Earp, California, and 4 miles north of Palo Verde Peak.

Without a detailed survey, location of rare species will tend to continue as a hit or miss effort. This type of hit or miss approach is neither economical nor practical, for the information gathered is improperly recorded and usually ends up as knowledge only to the person that does the field work. As soon as he transfers from the District, his knowledge leaves with him.

Evaluation of off-road vehicle use andits affect on the vegetation and soils should be intensified immediately. Plants can be damaged or destroyed through mechanical destruction of their above-

ground vegetative parts. Less well known is the damage through compaction of the soil around the plants. On the open desert an annual rainfall of 4 to 6 inches distributed over some months may moisten the upper layers of the soil. Therefore, plants like creosote bush, cacti, and goldenbrush tend to have very superficial, wide-spreading roots that can gather in what moisture becomes available. Any compaction around these plants would limit water infiltration and actually increase the drought conditions. Use in washes, water courses and basins would be less severe since vegetation that inhabits these areas, such as mesquite, palo verde, and ironwood, send roots down immense distances in order to tap underground sources of moisture.

Ground Water:--Any increased use of the Desert automatically demands water--especially recreation use. Exploration of potential water supplies should be started immediately. True, there are ample ground water surveys in the Valley but not in the mountainous areas where the water is needed. We anticipate that most of the water supplies will have to be harvested from small perched water tables.

Table 1.--Estimated annual runoff from public lands administered by Bureau of Land Management in California, by county[1/]

County	Area (acres)	Annual runoff (inches)	Annual runoff (acre-inches)	Annual runoff (acre-feet)
Inyo	2,270,438	0.20	454,088	--
Kern	533,001	0.20	106,600	--
			560,688	46,724
Imperial	391,782	0.05	19,589	--
Riverside	1,419,154	0.05	70,958	--
San Bern.	7,035,092	0.05	351,754	--
			442,301	36,859

1/ Source: HA 212.

Most of the present area receives little moisture, has scant vegetation and a shallow soil mantle, is exposed to climatic extremes during parts of the year, and supports a variety of delicately balanced biological life. All of these factors contribute to the fragile nature of the Desert.

The soils here are young and immature. They have not been fully developed owing to present climatic conditions. Therefore, any soil loss caused by man's disturbance will reduce the capability of the soil to provide the necessary soil nutrients for vegetative growth. As the population increases, the need for land with soils capable of producing desert vegetation, forage and agricultural crops will increase. Thus, lands having potential for production should be identified and properly managed to conserve them for future use.

To develop a sound resource management plan compatible with intensive use of the Desert, the BLM must learn something about the nature and properties of its desert soils, the vegetation thereon, uses that can be made of the soils, and the effect climate has on the soils.

It is the physical and chemical characteristics of soil, when coupled with vegetative and climatic aspects, that can provide BLM with answers to the effects of (1) watershed management practices on runoff and sedimentation, (2) types of plant growth best suited for forage and protective cover, (3) road and right-of-way construction, and the construction of campsites and campgrounds, (4) landscaping,

(5) proposed agricultural use, and (6) the allowance of one or more uses in certain areas of the desert. The Bureau must acquire the necessary funds and manpower to study adequately the physical and chemical characteristics of the Desert soils, so that their utilization can be planned and controlled in a manner that will assure continued beneficial uses of the resources dependent thereon. Ignorance of their character and capabilities can only result in the Bureau not doing enough to prevent their deterioration for supporting biological life, and not doing an adequate job of preventing the loss of vegetation so vital to desert esthetics.

AVAILABLE DATA

Reports

The Soil Conservation Service has prepared general soils reports for Imperial County and part of San Bernardino County. The total surveyed acreage is about 5,417,000 acres (table 3/). The reports are very general because the information was taken from other reports, studies and individual soil surveys. They are suitable only for general planning.

The Bureau of Reclamation has completed sub-reconnaissance and reconnaissance soil surveys of 2,385,923 acres of land within the Desert Study Area (table 2/). They also are very general and suitable only for planning purposes. Most of the reports for the survey areas are available. Pertinent data from the unpublished reports can be onbtained from the Bureau of Reclamation, Region 3, Boulder City, Nevada.

About 2,000,000 acres of land have been classified as arable or potential irrigable lands if water becomes available. This acreage is scattered in small parcels throughout the Desert Study Area. It is not feasible to develop this land owing to the lack of irrigation water. Should additional lands be identified as feasible for irrigation, perhaps it may be possible to extend California Water Development Plan to cover such areas.

The Bureau of Indian Affairs is conducting soil surveys upon lands located within the Indian reservations.

The U.S. Army Earth Sciences Research Laboratory has published reports upon flooding conditions on the desert.

The _____ has recently developed a climate map for the Southwest area, including California.

Maps

The California Region River Basin Studies Subcommittee has prepared general soils maps for the entire Desert Study area. These maps were developed by projecting soils data from specific survey areas, other field data, and geologic inference. The soil delineations are very broad and extensive. They should not be used for program development purposes, but are suitable for general planning use.

STUDIES UNDERWAY

The BLM is now developing a soil inventory program for the public lands. Inventory procedures have been developed to collect soils and associated data needed to make sound resource management plans.

The Bureau of Reclamation is making subreconnaissance soil surveys (general) on the inland basins in southern California to

identify potentially irrigable lands should water become available. It plans to complete subreconnaissance surveys west and south of Needles, California, to add to areas already surveyed. The BLM could utilize this data for more intensive survey work in those areas.

Where the Bureau of Reclamation identifies public desert lands as suitable for irrigation, the BLM must be prepared to analyze the impact of such potential should water become available for irrigation purposes. Irrigation development would involve the granting of rights-of-way construction of roads, increased recreation pressures, zoning, homesite development near the project with attendant commercial facilities, provision of refuse disposal sites, and other problems of lands use associated with urban and rural growth.

The Soil Conservation Service is primarily concerned with soils on privately owned lands, but will also survey adjoining public lands that have agricultural potential.

Benefits

Several benefits will accrue from soil surveys. By knowing the physical, chemical, and mechanical properties of soils we will be able to determine the best land use and capabilities for that use. An inventory would help identify soils most susceptible to damage from such uses as off-road vehicular activity, uncontrolled grazing, and uncontrolled mineral exploration. In addition we need to know if soils can be improved or damaged by this use. The only way to put a dollar value on the soil is to measures its yield in crops, forage, protective vegetative cover, water yield, and other uses put on it.

Identifying and understanding soil capacilities will assist the BLM in resolving desert use conflicts in desert use. The Bureau would, for example, be able to prevent recreation development in areas potentially suitable for agricultural use or too fragile for compacting by human use. It could prevent locating refuse disposal sites in areas where leaching might pollute underground water supplies or cause surface pollution of soils incapable of absorbing liquid pollutants. It could determine what capital improvements should be relocated because their location may be hazardous to human life or cause deterioration of desert environment. Soils data could also be used to provide standards of construction for improvements in particular areas.

PROPOSED PLANS

The present available soils data are not adequate for development purposes in areas that are proposed for intensive use. A soil inventory should be completed for the 4,500,000 acres of desert lands where intensive use is anticipated.

Coordination

Before any soil inventory is scheduled, plans for coordination of the survey efforts must be completed because practically all of the resource data can be collected by one inventory team. The BLM soil inventory procedures contain guidelines for collecting vegetative and soils information together.

Soil inventories should be planned in order that field work will be completed ahead of development. The most satisfactory procedure would be to complete a soil inventory prior to planning. But because

of the time factor, we suggest that proposed project areas should be given first priority in soil inventory.

Coordination with other agencies conducting soil surveys is necessary to avoid duplication of efforts. Because of the Bureau's personnel limitation on soil scientists, we should consider the possibility of contracting with SCS, BR, or universities to do the soil inventory provided manpower is available. But if funds become available, the work can be done in-house.

DATA NEEDED

Although the BR and SCS have made general and reconnaissance soils reports covering 6,000,000 acres of private and public lands in the Desert Study Area, the data are suitable only for general planning purposes. But we should not reinventory the areas that have been covered by SCS and BR. The reports can be used to identify problem soils, assist in soils legend development and to plan for an intensive soil inventory program. Better quality or higher intensity soil surveys are needed by the Bureau to collect adequate soils data that will assist its various program activities when planning and developing a resource management program

Data Needed

A soil inventory program must be developed to collect the necessary soils data that will assist the following activities:

- Watershed: to evaluate erosion, present and potential runoff, water quality and quantity, sedimentation, improvement of vegetative cover by seeding, potential for seeding and moisture retention capacity of soils.

- Range: to evaluate forage production potential, potential for seeding to increase forage, and water holding capacity of soil for improved water yield.
- Wildlife: to evaluate forage habitat suitability for wildlife and to assist in determining potential stream pollution because of soils contributing to turbidity.
- Land functions: to evaluate areas suitable for agriculture and urban use in the BLM's land classification program, to assist local governments in their zoning efforts on suitable uses within a zone, and to determine value potential for BLM land appraisal functions.
- Recreation: to evaluate the effects of compacting on soils from overuse, to determine suitability of soils to be used for septic tank and drain field purposes, to determine suitability of soils to be landscaped, to determine the susceptibility of soils to flooding and erosion.
- Engineering: to determine engineering properties of soils before construction of improvements, to estimate soil susceptible to slipping and sloughing, and to determine soils and materials suitable for roadbed construction.

Table 8.--Subreconnaissance and reconnaissance Soil Surveys of the Desert Study Area, California, by Agency

Survey Area	Acres Surveyed	Arable 2/ Acreage	Total Acres in County	Acres 3/ Presently Under Irrigation
Bureau of Reclamation				
Amorgosa (Calif.)	2,430			
Antelope and Fremont	699,250			
Barrego Valley	88,500			
Chuckwalla Valley	82,650			
Coachella	90,680			
Dos Palmas	65			
East Mesa	35,900			
Fish Springs	459			
Indian Wells - Searles	117,000			
Mesquite Valley	26,473			
Lower Colorado River W.S.	22,403			
McCoy Wash - Rice Valley and Palen	95,926			
Mjoave Water Agency 1/	794,600			
Morongo-Yucca-29 Palms-Upper Coachella	107,226			
Pahrump Valley (Calif.)	34,984			
Panamint Valley	36,880			
Pilot Knob Mesa	15,123			
West San Bernardino Co.	4,528			
West Mesa	82,944			
Salton Area	1,339			
Sand Hills Area	36,945			
Saline Valley	9,618			
BR Subtotal	2,385,923	2,183,039		
Soil Conservation Service				
Imperial County	2,417,000		2,950,000	654,000
Mojave Desert Area (San Bernardino County)	3,000,000		12,833,751	42,865
SCS Subtotal	5,417,000			
Subtotal	7,802,923			
1/	- 1,200,000			
Total	6,602,923			

1/ Duplication of survey efforts by SCS and BR on approximately 1,200,000 acres.
2/ Arable if irrigation water becomes available.
3/ Privately owned lands.

THE RANGE RESOURCES

On about one-third of the California Desert, the dynamic desert ecosystem reached its present ecological stage with domestic livestock as a component for the last 90 years. The many studies dealing with ecological changes in the vegetation attribute these changes to several factors, including climatic, rodents, and livestock use.

Studies dealing with livestock use emphasize its effects on the spread of shrubby plants by transporting seed and vegetative parts of plants, as well as influences of overgrazing.

Of the factors considered, climatic change and grazing use have in the past exerted the most influence on vegetation change. But more recently there are indications that the mechanical scarification of vegetation by drive wheel vehicles and motorcycles may have a significant influence on desert ecology. The climate in the California Desert is characterized by periodic droughts, high intensity storms, only a fraction of the meager precipitation and dry winds penetrates the soil surface deeply enough to become available for plant use.

Because of the high temperature, a considerable amount of moisture is lost through evaporation. Plant responses to temperature in the Desert are as complex as the moisture responses. Temperature affects seed germination of many plants. With desert annuals it is one of the factors determining their distribution. In some desert plants, critical physiological functions require a specific temperature range. Others require a specific temperature range that must coincide

with a specific moisture pattern. The frequency, intensity, and duration of freezing control the zonation of plant communities.

The variability in forage production and its availability for livestock grazing is high, erratic and undependable. When favorable climatic conditions prevail, the range produces an abundance of ephemeral vegetation. This sporadic production of ephemerals in some areas is intermingled with perennial plant production which may be fairly consistent from year to year.

Because of the many differences in plant communities in the California Desert, livestock management criteria must be designed to meet the many vegetative variations. Such criteria must recognize the growth requirements of the forage plant. These criteria must include an understanding of the needs of animals using the range and must also include a consideration of necessary range improvements and a means of identifying other than grazing values. Last, but not least, the criteria must consider the social and economic implications of the range management system on the Desert.

FORAGE AREAS

Ephemeral Forage Areas

The plant communities in this category periodically provide forage of ephemeral (annuals) nature. Typical vegetation within these plant communities include creosote bush (Larrea tridentata), mesquite (Prosopis juliflora), cacti (Opuntia spp.), ocotillo (Fouquieria splendens), and Spanish dagger (Yucca schidigera). Grasses are generally limited to summer annuals, such as 3-awn (Aristida spp.), and red brome (Bromus

rubens). Browse plants, consisting of Bur sage (Franseria dumosa) and Range ratany (Krameria parvifolia), [redacted] contribute to the forage production in the areas suitable for livestock grazing.

The [redacted] annual forbs, when present, include filaree (Erodium cicutarium), Indian wheat (Plantago purshii), and Marigold (Baileva) in addition to the annual grasses.

In the years of abundant moisture and other favorable climatic conditions, annual weeds and grasses produce 2,000 to 4,000 pounds of forage per acre. The season is usually short lived. These favorable years are highly unpredictable and occur about 1 in 5. In about 2 of every 5 years, the forage production is so low the range is unusable for livestock. About 3,400,000 acres of the California Desert fall in this category.

Perennial-Ephemeral Forage Areas

The plant communities in this category are range sites that normally produce livestock forage, but in addition to the perennial plant production they periodically provide ephemeral forage. Typical perennial vegetation includes blackbrush (Coleogyneramosissima), Joshua tree (Yucca brevifolia), hop sage (Grayia spinosa), spiney mendora (Mendora spinescens), indigo bush (Dalea spp.) winter fat (Eurotia lanata), cattle spinach (Atriplex polycarpa), golden bush (Haplopappus spp.), big galleta (Hilaria spp.), black grama (Bouteloua eriopoda), and desert needlegrass (Stipa spp.). The ephemeral forage includes filaree, Indian wheat, [redacted] Russian thistle (Salsola kali tenuifoloa), and annual grasses.

In years of abundant moisture and favorable climatic conditions, annual weeds and grasses add materially to the total grazing capacity. The California Desert has about 2,500,000 acres in the perennial-ephemeral forage areas.

RANGE MANAGEMENT

The California Desert holds about 5.9 million acres of Federal rangeland that is considered suitable for livestock grazing. The BLM manages grazing on this land on a year-long basis with a minimum of direction or control.

Allotment Management Plans

The Bureau allows livestock owners to graze their animals on BLM land under a permit or lease arrangement. It develops allotment management plans in cooperation with range livestock users. The plans specify an action program that applies the intensity of management needed to reach specific goals for the site. The goals must be coordinated with and be compatible with other resources program goals. The grazing system is a major component of the allotment plan. It can schedule, restrict, or both, the livestock grazing so that it will be compatible with these other resource uses.

Two grazing allotments now have intensive grazing management being applied by approved plans. Twenty-six additional allotments have problems related to resources. To solve these problems, allotment management plans will be necessary.

In some allotments, the present intensity of management is considered adequate. But many allotments reflect unsatisfactory range conditions (table 1), and need more intensive management. Most allotments

are grazed year-long whenever forage is available. This practice has contributed to the unsatisfactory conditions.

Most of the grazing allotments include both private and BLM land. This condition emphasizes the importance and necessity of a close working relationship between Bureau personnel and the grazing licensee or lessee.

Range Inventory

A range inventory has been completed on 1,500,000 acres of the allotments. These inventories are necessary as a prerequisite to the development of allotment management plans. They define the extent and composition of the various vegetative types, as well as establish a stocking rate for guidance in developing grazing systems for the allotment management plan. Resource inventories are required on [redacted] MosT perennial-ephemeral forage areas.

In allotments, or leases in ephemeral forage areas containing predominantly annual forage plants, little value would be served by making a detailed inventory other than defining the extent of the various types. Therefore, range inventory work will not be emphasized in these areas, and will remain a low priority unless necessary in solving a particular management or legal problem when grazing capacity for a particular season is required. Out of the 5.9 [redacted] million acres of grazable land in the California Desert it is estimated that additional resource inventories will be required on 2.3 million acres in both forage type areas.

PROBLEMS

Vegetation

Several species of poisonous plants are found on the California Desert that present livestock and management problems. Livestock loss due to lethal consumption of these plants is not readily apparent. The effects are often accumulative, and some time may be required before the damage is evident. The potential hazard is greatest when livestock are put on the range before adequate nutritious forage is available, or when the livestock are left on the range after the more palatable forage plants are consumed. These conditions or situations are quite common when a range manager attempts to rely on ephemeral vegetation to sustain his livestock.

Some of the more common poisonous plants include loco (Astragalus spp.), thickleaf drymary (Drymaria pachyphylla), golden weed (Haplopappus spp.), annual lupine (Lupinus spp.), nightshade (Solanum spp.), and cocklebur (Xanthrum spp.), milkweed (Asclepias spp.), Greasewood (Sarcobatus vermiculatus).

Areas where poisonous plants present management problems must be identified and considered when designing the grazing system for the allotment management plan.

Another significant problem within the California Desert is the sporadic production of ephemerals. Not only is it a gamble in trying to forecast or predict when a supply of forage will be available, but the duration of the supply is also highly unpredictable. This uncertainty presents livestock handling and related economic problems of great magnitude.

Livestock

When unregulated livestock graze the desert area they usually scatter over a large area, depending upon water and forage conditions. Their owners usually give them only slight attention. When this situation exists and unregulated travel by the recreationist or general public prevails in the area, livestock losses from theft, disturbance, and shooting becomes significant.

People

Recreationists tend to congregate or camp near sources of water. At times this concentration prevents livestock from watering and becomes a significant problem because of the limited water supply in the desert area. Feral burros also compete for forage and water.

Indiscrimination and malicious use of firearms by recreationists within the Desert Area also takes its toll in livestock losses, as well as damage to water tanks and other facilities. Gates left open and fences and other facilities damaged by vandals always present problems when livestock and other conflicting uses are not coordinated and supervised.

PROPOSED PLANS

Factors that affect the role of Desert ranges include competition for land for other than grazing use, and livestock economics. The livestock producers will be facing the need to market a higher quality product, with strict control on volume geared to both foreign and domestic markets. When livestock are scattered over large areas of marginal grazing lands, it is difficult to exercise the necessary livestock control, and these fringe operations may go out of business.

Management Needs

The most logical way to manage the range resource within the California Desert Area is to develop allotment management plans that identify the problems and define the management objectives. Present resource information is inadequate for this purpose. Until each allotment management plan is developed, it is impossible to determine the extent of facilities, such as water developments and fences needed.

And livestock and range management programs must recognize the vegetation responses and demand on the vegetation by other than livestock uses. This may require restricting or eliminating livestock use from some areas, and possibly scheduling other resource uses, such as cross-country dune buggy and motor bike races, where they will not present conflicts.

Benefits

It does not appear that increased management of the range resources will result in a significant increase in forage, nor is there much opportunity for forage development (seeding or reseedings, etc.). The major benefit from grazing management will be derived by maintaining a ground cover that will sustain current range forage use and will enhance the values of other resources such as watershed, wildlife habitat, recreation, and scenery.

THE WILDLIFE RESOURCES

This part of the Report is concerned with the terrestial wildlife species and their habitat. The status of herpotological species--amphibians and reptiles--was reported in the Scientific Values Section. We have emphasized here the status of wildlife and wildlife habitat, uses of this resource, future projections, and the detailed planning needed to manage the resource adequately.

SPECIES

Nearly 200 vertebrate species are found in the Desert. Only a few of the more important game animals are listed: Inyo mule deer (Odocoileus hemionus inyoensis), Rocky Mountain mule deer (Odocoileus hemionus hemionus), Burro deer (Odocoileus hemionus eremicus), California mule deer (Odocoileus hemionus californicus), Southern mule deer (Odocoileus hemionus fuliginatus), Desert bighorn sheep (Ovis canadensis nelsoni), and Peninsular bighorn sheep (Ovis canadensis cremnobates).

Upland game birds include: Gambel quail (Lophortyx gambelii gambelii), California quail (Lophortyx californicus), Pallid Mountain quail (Oreortyx pictus russelli), Desert Mountain quail (O. p. eremophilus), Chukar partridge (Alectoris graeca chukar), white-winged dove (Zenaida asiatica mearnsi), mourning dove (Zenaida macroura marginella).

Rabbits and hares include: Audubon cottontail (Sylvilagus audubonii) and black-tailed jack rabbit (Lepus californicus).

Non-Game

Non-game animals include the kit fox, coyote, badger, bob cat, gray fox, spotted skunk, raccoon, muskrat, beaver, several varieties of ground squirrels, chipmunks, wood rats, mice, other rodents, and several species

of waterfowl. A number of rails, shore birds, loons, herons, egrets, bitterns, and teals are found to be frequent visitors. Undoubtedly, most of these water birds are more attracted to areas such as the Salton Sea and Colorado River areas. Nine species of bats have been noted in the Joshua Tree National Monument area.

USES OF RESOURCES

The river basin framework committee of the Bureau of Sports Fishery and Wildlife has compiled preliminary figures on the uses of wildlife resources. These figures are subject to review and revision before final publication of the California Regional Framework Study. Its figures include all land within the Desert Study Area. Monetary values are conservative estimates based on recent economic surveys made in several Western States. The percentage of annual visits spent in a wildlife use and of amount of money spent that is attributable to BLM land should be nearly proportional to BLM ownership, or about 70 percent. The figures for all uses:

Type of use	Annual visits expended (No.)	Amount expended annually (Million dollars)
Consumptive (hunting)		
Big game	120,000	2 - 3
Upland game birds	340,000	3.4 - 5.1
Migratory water fowl	130,000	1.3 - 2.0
Rabbits	150,000	1.5 - 2.3
Non-game animals	4,250,000	42.5 - 63.8
Total	4,990,000	50.7 - 76.2
Non-consumptive use	4,300,000	43.0 - 64.5
Total use	9,290,000	93.7 - 140.7

The present number of visits--9.2 million--will undoubtedly increase at a slightly higher rate than the over-all population. The dollar value of this resource is difficult to project, but it will most certainly increase in at least the same rate as visitor-use. The predicted larger percentage of income available per capita for recreation provides a good reason for suggesting a higher rate.

Consumptive Use

The principal consumptive use of wildlife resources--hunting--will increase from about 650,000 hunting licenses now sold annually each year in California to a projected 800,000 by 1980. But the demand in relation to population increase will drop from about 350 hunters per 10,000 people to 290 on a statewide basis. The California Fish and Game Department has identified the primary cause of this decrease as the space required to pursue and enjoy hunting. Since the Desert provides a relatively large open space, present hunting pressures could well be shifted--as concentrations occur--from the central and coastal parts of the State to the southern part.

Non-Consumptive Use

Many wildlife experts believe that non-consumptive uses of desert wildlife resources will become more important than consumptive uses (hunting). Such uses include viewing wildlife, photography, and scientific study and observations. All signs suggest that non-consumptive use is rapidly increasing in popularity. A less tangible but significant aspect of wildlife enjoyment is an awareness of the presence of wildlife species.

HABITAT MANAGEMENT

Several agencies and institutions are concerned with wildlife planning and management. The Bureau will need to coordinate it's work with them in any comprehensive planning effort for the Desert. The Bureau of Land Management has drafted one habitat management plan (New York Mountains area) and is developing another (Santa Rosa Mountains Area). Its Yuma District Office has completed a Lower Colorado River Plan which includes some considerations of wildlife habitat. BLM has installed a few water developments in cooperation with the California Department of Fish and Game.

Considerations for big game are usually written into the Bureau's livestock allotment grazing plans.

The California Department of Fish and Game's fish and wildlife program (965) includes species plans for all game animals and some non-game species. The plan is projected to 1980. The Department is now updating the plan. It intends to continue cooperative planning and to include more work with BLM on BLM-administered lands. They have constructed numerous water developments in the Desert area.

The Bureau of Sport Fisheries and Wildlife is coordinating the river basin framework studies and related planning efforts. Regional and sub-regional reports for the area included in the Desert Study. were to be completed in spring 1969.

The University of California is conducting a number of studies of the flora and fauna in the Desert.

PROBLEMS

Increasing Demand

Present trends and projections suggest a slowly decreasing habitat and wildlife population. This decline will, however, not deter an increasing

number of people from using the Desert within the next 10 to 15 years. Demand will continue to increase, with or without management. And wildlife values, without planned full management, will decrease at a rapidly accelerating pace. But with proper management, the BLM can probably look forward to entering the year 2000 or even 2020 with a valuable wildlife resource still capable of satisfying, at least in part, the human demands upon it.

Current Losses

Quantitative information is generally lacking, but we have good reason to believe that some wildlife values are being lost. Bighorn sheep, for example, have lost some habitat and their numbers have dropped because of human appropriation of vegetation, water, and space. The rare peninsular bighorn sheep is gradually being crowded out of its habitat in the Santa Rosa Mountains.

Deer habitat has probably been lost because of domestic sheep grazing in the northwest part of the Study Area. Other losses of habitat have evidently occurred for the following rare or endangered species: [redacted] Southern bald eagle, American Peregrine falcon, greater sandhill crane, Yuma clapper rail, [redacted], and black toad.

Upland game bird may well be losing their habitat in areas where heavy recreation is interfering with life cycle functions, such as nesting and brood raising. [redacted] Further study is needed to verify this condition.

Conflicts

Among the many conflicts that exist, several are worth citing. Bighorn sheep are probably not compatible with human use of the same

immediate area. Nor are they very compatible with livestock use (domestic or feral). Both situations exist in the Study Area. Deer are not compatible with overuse of forage by livestock nor with complete appropriation of water by humans. Again, both situations exist.

The compatibility of any wildlife species with the various types of intensive recreation use is not thoroughly understood. But there is enough evidence to suggest the need for research.

Water in the Desert is scarce. Competition for the available supply among wildlife species and between wildlife and human use is apparent in many places throughout the Study Area.

Limitations

Legislative authority and regulations appear to be adequate for wildlife habitat management planning. But implementation of habitat management is often impeded by inadequate or restrictive legislation and regulations or both.

Manpower and money supply is inadequate to do necessary detailed inventory and planning. The two BLM districts (Bakersfield and Riverside) with land in the Desert Study Area have about 8 man-months each for their entire wildlife program.

PROPOSED PLANS

Inventory

The present BLM habitat inventory shows the general locations of major wildlife species in Desert Area. This information constitutes a beginning effort, but is inadequate for planning. We need to complete a detailed Habitat Inventory and Analysis for all wildlife

species including reptiles, amphibians and arthropods. Standard BLM procedures (Manual 6600, Habitat Management System, and Manual 6610, Habitat Inventory and Analysis) should be followed.

We need (1) detailed inventory of present and potential habitat including habitat segments used for important life history functions, (2) the establishment of Wildlife Habitat Areas for intensive study and management, (3) the determination of relative management needs among Wildlife Habitat Areas and the preparation of management priority recommendations based on these needs, (4) the identification and documentation of habitat and habitat-related problems, (5) the formulation and analysis of management alternatives which will solve the above problems, and (6) the development of management recommendations for use in coordinated resource planning and resultant Habitat Management Plans.

Planning

Wildlife management recommendations as developed in the Habitat Inventory and Analysis need to be coordinated with other resource management recommendations. Management decisions must be made and habitat management plans developed for each identified wildlife habitat area (BLM Manual 6620, Habitat Management Plans). The Bureau is hampered in accomplishing wildlife habitat management planning by the lack of manpower and basic habitat inventory data.

Cooperation with the California Department of Fish and Game in developing wildlife plans for the Desert is essential. The Department has indicated its willingness to help.

Research

We need research to fill the gaps in our knowledge of basic biology and ecology. Two types of research are needed: the first is primarily a matter of compiling existing research findings and developing detailed descriptions of species life histories and habitat requirements as they pertain to BLM needs. The second type of research is that concerned with field work: (a) basic research in life histories and habitat requirements, and (b) research in ecological effects of other land uses on pertinent wildlife species and their habitats.

We should also investigate areas of planned recreation development and areas where recreationists are now concentrating. And we need to study non-compatible or conflicting uses in other categories, such as livestock grazing (domestic and feral).

THE FISHERY RESOURCES

Some fisheries in the California Desert attract some of the heaviest angler use in the State. Others are of interest primarily to ichthyologists (zoologists concerned with fishes) and students of natural history.

The legal responsibility for management of fish in the Desert rests primarily with the California Department of Fish and Game. Its Division of Inland Fisheries has an experienced scientific staff and a special section that is managing several habitat areas of desert fish. The Bakersfield District of BLM is now working closely with the Division staff in Owens Valley.

The California Department of Fish and Game has a small staff managing the various fisheries of the lower Colorado River system. Conservation officers monitor sport fishermen using the canals and ditches leaving the Colorado River projects for irrigated lands. The inland fisheries staff also is engaged in monitoring and management of the extremely popular Salton Sea fishery.

The western region of U.S. Bureau of Sport Fisheries and Wildlife works with rare and endangered species of fish and wildlife and its river basin section in Sacramento prepares impact reports on all water development projects built with Federal funds.

The Bureau of Land Management's responsibility for managing the habitat of aquatic and terrestial wildlife should mesh closely then with the activities of state, federal agencies and universities in the effort to manage, protect, and utilize fish populations.

The highly restricted populations of fishes in the Desert are of primary interest to naturalists, ichthyiologists, students, and a growing segment of the general publis who have an interest in the unique heritage. The displays at the Death Valley National Monument and the indoor desert fish aquarium at the Desert Museum near Tuscon, Arix., for example attract many visitors.

Even though desert species of fish are of little direct economic importance, there is enough interest from the scientific community to protect these rare and endangered populations. The BLM is already committed to protecting the habitat of rare and endangered species of wildlife. It must have an adequate number of wildlife personnel with fisheries background to cooperatively work with various agencies and institutions of learning and science to study, protect, and properly utilize desert fisheries.

The desert study area should be extended to include the desert habitat in Inyo County east of the Inyo and White Mountains. Several spring areas could be important for transplantation of desert fish to establish additional populations.

Desert fish found in restricted habitat include;

Armagosa pupfish (Cyprinodon nevadensis)

Salt Creek pupfish (Cyprinodon salinus)

Owens Valley pupfish (Cyprinodon radiosus)

Mahave
~~Mojave~~ chub (Gila mohavensis)

Speckled dace (Rhinichthys osculus)

Mosquitofish (Gambusia affinis)

Desert pupfish (Cyprinodon macularis)

Owens Valley chub (Gila n. sp.)

Owens Valley sucker (Catostomus n. sp.)

Arroyo chub (Gila orcutti)

Eight universities have shown a definite interest in desert fishes. They include Scripps Institute of Oceanography, University of Michigan, Univ of Nevada at Las Vegas, [redacted] State College, Arizona State University, and University of California at Riverside, University of California at Berkeley, and Utah State University. Some universities, such as Univ. of Nevada at Las Vegas, [redacted], use the habitat of these fish as field laboratories to train students for under graduate and graduate training.

Current losses

In the last 100 years, the aquatic habitat and the fish faunas of the American southwest have undergone radical changes. Six or seven species have become extinct, at least 13 others have been either locally exterminated or are so endangered that they too may vanish. These 19 or 20 species constitute almost 20 percent of the known aboriginal fishes of western North America. The only remaining pure strain of the Mojave chub, for example, is located in a spring developed at Soda Dry Lake on a resort on BLM land.

Problems

Destruction of some of the habitat of these species has been primarily from diversion of water for other purposes and lack of protection of springs from livestock and game. Some of these small springs contain warm water that becomes a temptation for people to introduce tropical fish.

The introduction of tropical and other fish not indigenous to the water system has caused serious competition and cross breeding. Some populations have been completely displaced. A major problem is the protection of the remaining populations from collectors themselves. Law enforcement or new laws are needed to protect remaining populations. One problem will be the difficulty of convincing the general public and administrators of the necessity of saving these remnant stocks of desert fishes.

Protection of the present habitat will have the potential of saving some of the remaining population of these rare desert fish. It is possible that, with artificial water development and additional work on spring areas, the present populations of fish could be transferred to suitable habitat. Existing populations could then be doubled or tripled.

SALTON SEA AND TRIBUTARIES

Although the 220-surface-acre Salton Sea and its tributaries are primarily on non-public lands, their fisheries provide a unique attraction to recreationists. The presence of salt water fish in inland waters is not matched elsewhere in the country, and draws both local and out-of-state anglers. With its fishery resource, water-based recreation, campground, and resort facilities, the Salton Sea area provides a natural location for side trips into the California Desert. Public lands can expect to receive heavy use from this concentration of people if the fishery remains in good condition.

Fish found in the Salton Sea include:

Threadfin shad (Dorosoma petenese)

Desert pupfish (Cyprinodon macularius)

Mosquitofish (Cambusia affinis affinis)

Striped mullet (Mugil cephalus)

Sargo (Anisotremus davidsoni)

Bairdiella (Bairdiella icistius)

Orangemouth corniva (Cynoscion zanthulus)

Shortfin corvina (Cynoscion parvipinnis)

Longjaw mudsucker (Gillichthys mirabilis)

From 1963 to 1967, the number of angler trips ranged from a high of 377,010 to a low of 296,595. If the value of each trip is considered to be 5.50, the annual direct economic value from fishing use alone would exceed $2 million for the Record Year of 1965. And this figure does not include the value of more than 1,000,000 fish caught and consumed by anglers. The 5.50 value of an angler trip is used as a conservative figure for the total expenditures of anglers--not the amount they would pay for the privilege of fishing.

Management

The California Department of Fish and Game actively manages the Salton Sea fishery. Its research led to the introduction of aquatic animals and fish that have provided an outstanding fishery for Corvina, Sargo, and Bairdiella.

A study now in progress of Salton Sea, includes 17 participating state and federal agencies, 5 or more advisory agencies, and one private consultant.

Access to angling on Salton Sea is provided by the California Department of Fish and Game and the State Department of Parks. Access appears to be adequate, and these agencies should be encouraged to continue the program. To avoid problems over access in the future, isolated tracts of public land next to the sea should be identified and reserved for public recreational use.

Fishing piers have been suggested to accommodate needs of anglers without boats. Piers would also permit fishing in deep water that is not now available to bank anglers because of the shallow shorelines.

Problems

The major problem now is the possible loss of the entire fishery. Recent studies have indicated that some losses can be expected by 1971 if some method is not found to halt the rising salinity of the sea. The steady rise in salinity is caused by enrichment from domestic pollution and by fertilizers from the extensive irrigation projects draining into this sump. Fish populations will stop reproducing naturally if salinity rises to more than 40 parts per thousand.

Fish also populates the backwaters, sloughs, and hot springs of Salton Sea. Some of these areas hold tropical fish and populations of native fish introduced from the Colorado River; for examples, desert pupfish (Cyprinodon macularis). These populations could also be threatened if water quality deteriorates in the Sea.

Channel catfish farming is slowly becoming a recognized industry next to the Salton Sea. Most of the operations depend on deep wells (up to 900 feet) to provide proper water supplies. New operations now underway use water from canals. Economical operation will depend on

whether the water is classified for the lower-cost agricultural or high-fee industrial use.

The impact of this new operation is difficult to determine. If it becomes profitable to use canal water to rear channel catfish, there are many locations along the Coachella and All American canals, next to public domain, that may be adaptable for future reservoir areas in which to provide a sport channel catfish fishery. The legal status of such application to lands would have to be investigated.

LOWER COLORADO RIVER

The southeastern boundary of the Desert Study Area is the lower Colorado River, with its complex of reservoirs, backwaters, and irrigation diversions. The uses of the 265 miles of river and adjacent lands are coordinated by the Bureau's Lower Colorado River District Office, headquartered at Yuma, Arizona. At present the Bureau is not involved in the fishery or habitat management of the lower Colorado River. Immediate planning and management of fisheries on the River is a joint responsibility of the Arizona and California Departments of Fish and Game. Coordination of habitat management work between BLM and State Fish & Game Departments will be necessary in the future.

Current Usages

More than 604,000 angler trips are recorded each year on the California portion of the River. A small population of striped bass has been established in the river. If this fishery should improve, even greater use of the area for angling can be expected. Other water-based recreation, such as water skiing and boating, are major recreation uses, and fishing is growing in popularity. From Needles, California to Yuma, Arizona, at least seven major recreation sites in the California Desert

that are within a few miles of the river boundaries have been identified.

[redacted]

Problems

Protection of native fish in the Lower Colorado River is a pressing problem there. The U.S. Bureau of Reclamation is drastically changing the fish habitat by channelizing and removing phreatophyte vegetation. These changes have the potential of destroying the quantity and quality of the fish population. State of California fishery biologists are now trying to measure specific effects on the fishery.

Diversion of water to agricultural and other uses in the Lower Colorado River is having a decisive influence on the fishery resources. Some fish species, sqawfish, for example, that were once prolific have become increasingly rare as the River becomes a reservoir. In the 1930's, fishery biologists reported that ditches from the first Colorado River projects were clogged with native sqawfish and suckers. Farmers were able to haul away fish from the area by the wagonloads. But over the years, native fish have declined in numbers owing to changes in the river and blockages to their normal migration. It is doubtful that the BLM, by its work in the Desert Area, can reverse this trend.

IRRIGATION CANAL

The perennial flow into the canals and ditches of the Lower Colorado River permits the propagation of game fish. Popular game species include channel catfish, flathead catfish, and a few large-mouth bass. Canals in the populated areas are heavily used, but little use is seen

that are within a few miles of the river boundaries have been identified.

[redacted]

Problems

Protection of native fish in the Lower Colorado River is a pressing problem there. The U.S. Bureau of Reclamation is drastically changing the fish habitat by channelizing and removing phreatophyte vegetation. These changes have the potential of destroying the quantity and quality of the fish population. State of California fishery biologists are now trying to measure specific effects on the fishery.

Diversion of water to agricultural and other uses in the Lower Colorado River is having a decisive influence on the fishery resources. Some fish species, sqawfish, for example, that were once prolific have become increasingly rare as the River becomes a reservoir. In the 1930's, fishery biologists reported that ditches from the first Colorado River projects were clogged with native sqawfish and suckers. Farmers were able to haul away fish from the area by the wagonloads. But over the years, native fish have declined in numbers owing to changes in the river and blockages to their normal migration. It is doubtful that the BLM, by its work in the Desert Area, can reverse this trend.

IRRIGATION CANAL

The perennial flow into the canals and ditches of the Lower Colorado River permits the propagation of game fish. Popular game species include channel catfish, flathead catfish, and a few large-mouth bass. Canals in the populated areas are heavily used, but little use is seen

in the public lands portions. The California Department of Fish and Game monitors rather than actually manage the the fishery. It estimates that 5,987 miles of canals are available to fishermen.

Fisheries biologists report that the canals hold a substantial fish population. Little, if any, however, planning is being done. The irrigation companies do not always encourage fishing, and discourages it in some sites. This untapped potential fishery, with substantial areas of it next to BLM lands, could have a significant impact on future desert use. The drainage streams sumping into the Salton Sea (New and Alamo Rivers) also supports a fair catfish fishery, but here too, little management or planning has been done.

Potential

The fishery potential of the canals, suggests that if proper access and recreational facilities were developed, the number of angler trips could be boosted from the present 170,000 each year to an estimated 370,000. The complete potential is not known, but should be examined in any new study.

But if the irrigation companies were to provide a system to keep fish out of the canals, we could expect a potential loss of the entire fishery. And if they prohibit access to fishing in the canal, loss of the fishery is threatened.

Problems

The BLM lacks the regulatory authority and the permission of canal owners to instigate a program of management for the canal fishery. Regulations concerning the BLM's role in canal fishery management and the use of the water for management purposes (rearing and holding

ponds) will have to be developed. The trespass provisions of state law relating to public use of canals and banks will need study. And the use of the canals for fishing may be in direct conflict with agricultural and other uses.

A special problem is the lack of access to portions of the canals running through the dune and other areas. There are no camping facilities or drinking water within reasonable distance of the canals.

PROPOSED PLANNING

Restricted Populations

Before embarking on a plan of habitat and development for any of the desert fishes, it would be desirable to have a conference with key scientists who have been studying the e fishes for many years. This symposium should include representatives of the California Division of Inland Fisheries as well as scientists closely associated with the resources.

The extensive inventory of rare fish has been fairly well completed. An additional inventory is needed by the Bureau to find new habitat or areas where habitat could be developed.

An immediate program should be started to locate or develop another spring area in the Mojave River to transfer the only remaining pure population of the Mohave chub.

The general locations of the remaining populations of small fish are known. The BLM must acquire more information on specific locations and fisheries characteristics so that an emergency protection program can be carried out for these areas on public land.

Salton Sea

Several of the tributaries to Salton Sea should be investigated to see if immediate protection is needed for rare desert fish. Foremost is San Felipe Creek watershed. Most of the stream is on Bureau of Reclamation land, but some of the upper portions are within the Desert Study boundary.

An inventory of Salton Sea proper is probably a continuous operation by the California Department of Fish and Game. The BLM should periodically obtain the annual figures from the agency. An inventory should be made on some of the tributaries to the Salton Sea to determine if springs or residual portions of streams are actually on public domain land. A trout fishery now exists in the Canyon areas.

Lower Colorado River

The Lower Colorado River complex and adjacent desert lands are now prime recreation areas, and permanent residents and itinerant users are increasing. The attraction of the fishery resource has a major bearing on the amount of recreation use and should be managed properly; the BLM must play a role in that management.

Now that the Bureau is the controlling agency of the Lower Colorado River complex, it should immediately determine the impact of the channel changes and phreatophyte vegetation removal on the aquatic habitat.

The inventory of fishery access needs is well documented by the Lower Colorado River Land Office, California Fish and Game and Arizona Fish and Game Departments are actively managing the fishery.

Enough data can be obtained to determine the impact on desert lands by working directly with personnel of BLM's California State Office River Basin section and with Bureau of Sport Fisheries and Wildlife personnel in Sacramento, California.

There is a need to evaluate the habitat impacts on the fishery and to coordinate technical fishery information obtained from ongoing projects on the Lower Colorado River. Most important would be data on angling pressure and catch, and future predictions of angler use. Inventory users of the desert in this area so that the impact of the Colorado River recreation area on the adjacent public lands can be determined.

Irrigation Canals and Miscellaneous

Needed is comprehensive inventory of the available fisheries in the canals and the location of the best fishery potential. Inventory of fringe waters in the mountain areas along the west border of the study area also will be needed. And there is need for a maintenance inventory.

THE RECREATION RESOURCES

Rich in recreation resources, with unique natural features, significant sites of archaeologic and historic interest, and a variety of associated values. This is the California Desert. For many generations, the Desert has offered a wealth of opportunities for outdoor recreation. In the last two decades, increased leisure time, prosperity, and greater mobility have enabled more people than ever before to journey to the Desert for recreation. Until recently, little research was done to collect and analyze background data on recreation use in the Desert Area.

THE 1968 STUDY

In 1968, the BLM's California State Office and the National Park Service's Western Regional Office joined forces to assess the development & management of outdoor recreation on BLM land in the California Desert. Their report--titled "The California Desert"--is a preliminary study primarily concerned with recreation in the Desert Area. It includes recommendations of how recreational resources can be conserved, developed, and managed, and their wise use encouraged.

Recreation Findings

In addition to picnicking, camping, and hiking, the survey found that Desert visitors enjoy many other activities. They include driving for pleasure, sightseeing, observing Desert flowers, and taking photographs. And there were such specialized activities as hunting, target shooting, rockhounding, archer, wilderness experiences, scenery painting, cross-country motorcycling, and dune buggying.

These specialized activities often present their own unique problems. Some activities require many acres of land for proper enjoyment, while others, such as archery or target shooting, require only the use of very limited acreage. Some activities need a particular kind of area with certain geologic or atmospheric conditions...mountain climbing, dune buggying or sail plane flying for example. Or they may need the presence of particular resources, such as wildlife for hunting, or certain minerals for rockhounding.

Other Findings

Other main findings in the initial study were:

•Travel to the Desert: in pickups, or pickup-camper combinations--51 percent; in sedans or station wagons--39 percent; in four-wheel drive vehicles--8 percent. (Survey data did not include organized groups such as motorcycle clubs, school field trips.)

•Age groups using the Desert: Adults--63 percent; younger children--24 percent; teenagers--13 percent.

•Types of trips: Weekend-overnight--58 percent; others--42 percent. (To get to their destination in the Desert, 46 percent of the visitors traveled more than 150 miles from home.)

•Length of visit: 2 or more days--59 percent; 4 hours or less--14 percent; other--27 percent. (The long travel distances probably account for the extended stays in the Desert.)

•Frequency of visits: First visit--24 percent; visit at least two or three times a year--28 percent.

•Recreation activities: Camping and sight-seeing--50 percent; hiking--13 percent; rockhounding--12 percent; motorcycling--9 percent; dune buggying--9 percent; hunting and target plinking--3 percent. The motorcycle use is exclusive of all sanctioned motorcycle races on public lands, which along accounts for 375,000 to 450,000 visits a year. The field survey was conducted during spring. Therefore, the figures for hunting use did not reflect the true number of sportsmen who travel to the Desert Area in pursuit of game animal or bird.

•Destination: Desert is main destination--79 percent; Desert was an equal destination--15 percent; Desert was not main, equal, or secondary destination--2 percent.

RECREATION MANAGEMENT

In planning for the management of a quality recreation environment in the California Desert, the Bureau's objective is to manage its lands in a manner which will protect the health, safety, and comfort of the visitor while preserving and protecting its natural values and valuable resources.

To develop such a recreation program it is necessary to study the myriad of agencies conducting current programs in the Desert. They range from Federal and State agencies to county governments and private enterprise.

Federal Agencies

Bureau of Land Management.--With the passage of the Classification and Multiple Use Act in 1964, the Bureau began a detailed recreation inventory of lands within the Desert having high recreational values. This work was followed by detailed planning leading to the development of recreation facilities at Afton Canyon, Owl Canyon, Rainbow Basin, Wiley Well, Coon Hollow and Corn Springs. Additional recreation sites are awaiting construction funding.

As part of the Bureau's recreation program in the Desert, 49,733 acres in San Bernardino, Imperial, San Diego, and Riverside counties comprising some 43 recreation and archaeological sites and natural areas have been proposed for withdrawal from all forms of appropriation, including mining laws, but not from mineral leasing. The National Park Service has designated several [redacted] areas within the California Desert as National Natural Landmarks. More are now being considered.

In addition to maintaining developed campgrounds in the Desert, the Bureau is now exerting considerable effort, desert-wide, to clean litter and trash that has accumulated over many years by thoughtless users.

National Park Service.--The Park Service administers two large areas within and adjacent to the California Desert: Death Valley and Joshua Tree National Monuments. Both have numerous facilities and excellent management programs developed for visitors.

The NPS also cooperates with other agencies in the development of recreation oriented programs in the Desert. An example is a

feasibility study of the Lower Colorado River Valley Parkway in cooperation with the BLM's Lower Colorado River Land Use Office at Yuma, Arizona.

Department of Defense.-The Department of Defense has jurisdiction over 2.5 million acres of Desert land. Portions of these lands receive recreation use. Because of the nature of the militarys operations, it excludes the public from most areas for safety and security reasons.

Military installations in the Desert Study Area include: Edwards Air Force Base, Camp Irwin, U.S. Naval Ordinance Test Station at China Lake, Randsburgh Wash Test Range, Marine Corps Artillery Training Center, and the Navy's Camp Dunlap.

State and County Agencies

California Department of Parks and Recreation.--The State of California has a fine history of recreation management in and adjacent to the California Desert that dates from the mid-1930's when it acquired Anza-Borrego State Park. Since then it has developed excellent facilities at Salton Sea, Joshua Trees and Mitchell Caverns State Parks.

The Parks and Recreation Department is now studying the desert landscape province. The first phase of this study is designed to determine the basic resources in the area, with emphasis on historical, geological and natural scenic qualities.

Imperial County.--Owing to budgetary limitations Imperial County has been restricted in its efforts to develop and maintain recreation facilities in the Desert Area. The county has concentrated its activity mostly in the populated areas and in heavily traveled highways. For example, Hugh Osbwin County Park with limited facilities,

is on State Highway 78, about 4 miles west of Glamis in the Imperial Sand Hills. Also, water-oriented facilities have been provided around Salton Sea.

Riverside County.--Discussions with Riverside District Office personnel suggest that Riverside County is limited on funds to develop facilities in the desert. County efforts are directed towards main arteries of travel, populated areas, and the Salton Sea where use is heavy. The remote areas are planned and coordinated with the BLM and other Federal agencies having land jurisdiction in the county. More detailed information is available in the General Plan of Regional Parks, Riverside County.

San Bernardino County.--San Bernardino County, too, is limited in funds, and will look to the State's Park and Recreation Department and the BLM for support in developing and protecting the Desert resources in the county. The County has adopted a desert plan within its General Plan of Regional Parks. This plan was developed through the cooperative efforts of San Bernardino County Planning Department, the BLM, State of California's Parks and Recreation Departments, Forest Service, and San Bernardino County Flood Control Department.

Private Investments

Private planning efforts appear to be water-oriented and concentrated in areas along the Colorado River, the west side of the Salton Sea, and--in a minor effort--east of Barstow along the Mojave River.

Catering to the mobile population has stimulated a winter tourist industry along the Colorado River. Considerable planning and development

is available to the visitor who comes for an extended stay to enjoy winter homesites, trailer parks, and marinas.

Around the Salton Sea, planning is concerned with services catering to the weekend visitor from Los Angeles and San Diego areas and with providing desert homesites.

The recreation lakes developments along the Mojave River drainage east of Barstow are servicing primarily a local demand in day-use of swimming, boating, and fishing facilities. In some instances larger lakes are being developed for rural homesites to be located around them.

PROBLEMS

Resource Losses

Present recreation use of the Public Domain land in the California Desert is virtually unregulated. We estimate that the Bureau of Land Management has developed facilities to handle less than 1 percent of the annual recreation use in the Desert. Damage to natural, scientific, and recreational values is occurring and cannot be repaired. Expansion of suburban developments, water, power, gas and other transmission lines are taking their toll of natural recreation resources. Losses in historic and archaeologic sites have been heavy. Construction of roads has contributed considerably to the loss of scenic vistas and cultural resources.

Pollution is evident in many forms. Visual pollution can destroy the Desert before air pollution has a chance. Scars of World War II military maneuvers are nearly as visible from the air today as when they first occurred 25 years ago. Noise pollution can permeate miles of the Desert, destroying the serene effect created by an otherwise tranquil area. The noise problem stems from a variety of causes--from cross-country motorcycle use, to sonic booms by military aircraft on training exercises.

The removal of resources is occurring at an ever increasing alarming rate. Various vegetative specimens are not only being removed, one at a time, but are removed en masse from certain areas to the detriment of future desert visitors. Mining activity has left their mark on the Desert. And time alone will not be able to heal the visible scar. If uncontrolled use of the California Desert is allowed to continue, widespread deterioration is inevitable and irrevocable.

Limitations

The ownership pattern in the Desert includes private inholdings, checkerboard grants, military and reclamation withdrawals, and state school sections within the California Desert. This pattern imposes problems for the development of the full recreation potential. And present regulations do not allow the Bureau to purchase key inholdings outright in order to alleviate management limitations.

Among the other limitations facing the Bureau are:

•The Recreation Regulations of January 18, 1969 identifies circumstances under which use of lands may be restricted in order

to protect the public health and safety and the natural resources and other values. Lack of enforcement of these regulations is of great concern to Bureau field personnel.

•The Antiquities Act does not distinguish between major and minor objects of antiquity or scientific interest.

•The general mining laws permit exploration of the public lands at the discretion of prospectors who, in many instances, do not have valid discoveries.

•The Taylor Grazing Act, Classification and Multiple Use Act, Federal Antiquities Act and Petrified Wood Act authorize the management of the public lands for the conservation and protection of the resource values, but does not provide a means of enforcing these laws.

•People and motorcycles cannot be properly controlled where they threaten or disturb public land resources or accepted uses because Legislative authority which permits expeditious enforcement of rules and regulations is lacking.

•On a day-to-day basis, the BLM has only a limited number of field personnel to assist the public and provide surveillance over the public lands. Accidents, trespass, and illegal activities go undetected. Opportunities to assist the desert visitor and perhaps to prevent a tragedy go unheeded.

PROPOSED PLANS

The report "The California Desert" pointed out that the study area has the physical size and natural attributes essential to satisfy future demand. This demand is could soar from 4.9 million visitor-days

now to nearly 50 million visitor-days of recreation use by the year 2000. This is based on a program that identifies areas having recreation interest coupled with a facility development schedule that allows wise controlled use of the desert lands.

Policy

As recreation philosophy has developed over the years, certain basic concepts have been recognized and generally accepted. Two objectives of publicly supported programs are fundamental.

•Preserving for the enjoyment of future generations, representative examples of our natural and cultural heritage.

•Providing recreation facilities that are both adequate and conveniently accessible.

If these objectives are to be reached, a comprehensive, balanced plan is required--a plan developed cooperatively by all groups and agencies concerned, including local, state, federal and even private entities.

Recommendations

The 1968 California Desert Study recommended that the Bureau take the following steps in planning a Desert recreation program:

1. Set up a criteria for determining the boundaries of recreation lands in the Desert so as to include all potential recreational, historical, natural, and scientific values.

2. Evaluate all special uses, sales, and transfers in the Desert with consideration for recreational values in the multiple-use management of Desert lands.

3. Consider, in a comprehensive plan for the Desert, those key withdrawn areas with high recreation use and estimate the funds and manpower necessary to clear the land of ordnance and unauthorized uses.

4. Consider fully the visual appearance of the Desert in all future development on public lands, and act to minimize or erase existing scars on the landscape.

5. Seek legislative authority to enforce rules and regulations necessary for public recreational use of the Desert and for the protection and management of the area and its resources under the multiple-use concept.

6. Set up a system of patrol for the Desert, with uniformed rangers assigned geographic areas of responsibility.

7. Plan recreation developments in the Desert to meet demands, but at the same time provide unique opportunities for solitude, adventure, and separation.

8. Plan, program, build, and operate a Desert Center and a system of way stations on primary highways leading into the Desert.

9. Encourage concessions and private investments in public accommodations and facilities, as the need arises, to serve visitors to to public lands in the Desert.

10. Develop a system of roads throughout the Desert through cooperative planning with State and local governments.

11. Evaluate the specialized recreation activities and special provisions they may require for public enjoyment, safety, and protection of the Desert environment.

12. Develop facilities for off-road vehicular recreation.

13. Work with motorcycle user groups to select areas and develop facilities for motorcycle centers on public lands where damage to resources would be minimal.

14. Undertake a major interpretive program by providing educational and informational materials about Desert lands to the public.

15. Negotiate cooperative agreements with universities and scientific institutions to recognize and identify valuable natural or scientific resources in the Desert.

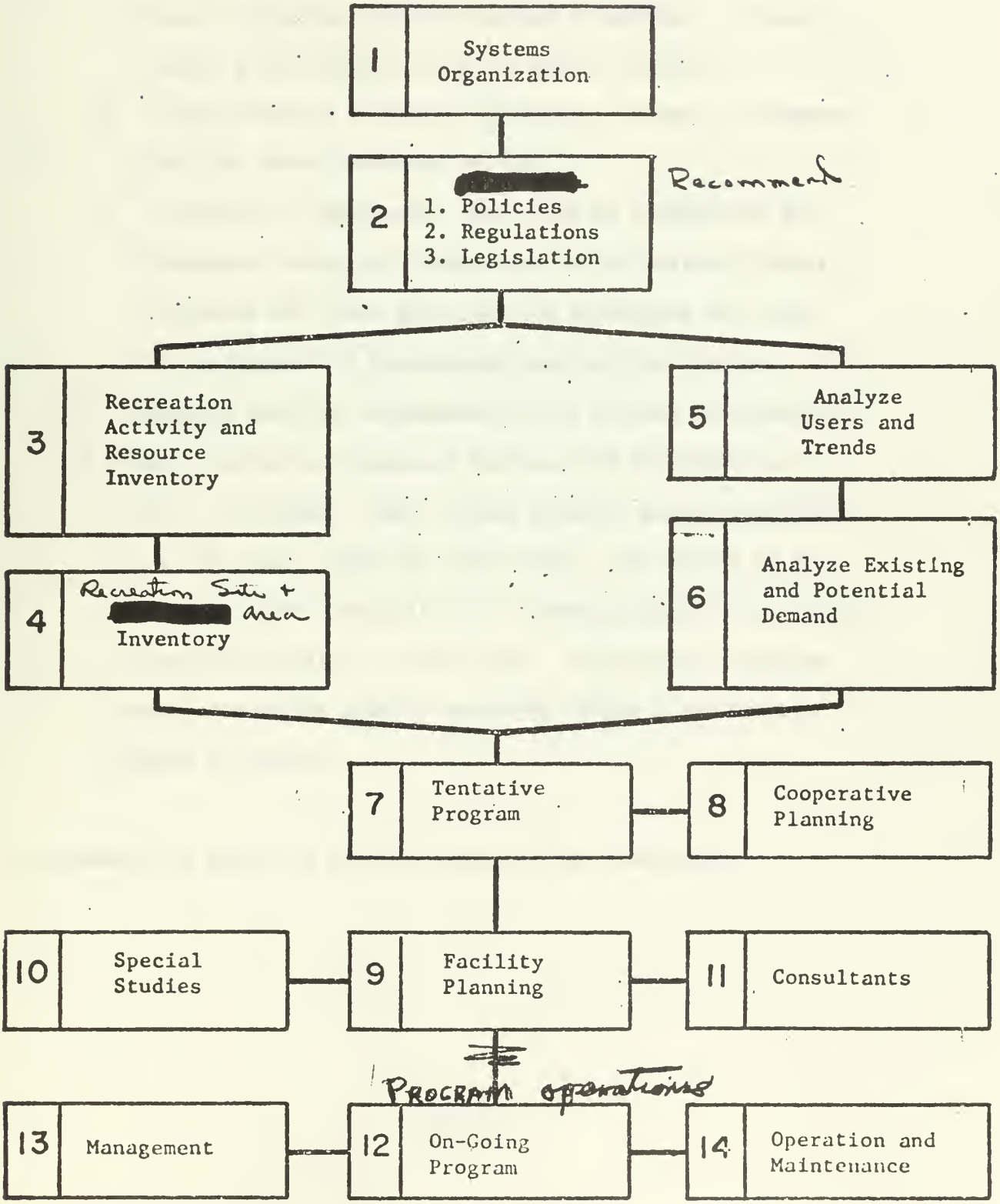
16. Assume responsibiilties for maintenance and cleanup in Desert lands by educating and informing users on the need to keep lands clean and facilities in good condition, and by hiring or contracting for clean-up services.

17. Develop immediately a program to insure full public participation in planning for the future of the Desert.

Organization

In planning a balanced program for the Desert, we suggest that a recreation planning system be adopted. Wherever possible, parts of the system can be automated by using electronic data processing. But judgment, however, will continue to be the basis for planning.

CALIFORNIA DESERT RECREATION SYSTEM
FLOW CHART



1/ [1.] The systems organization is made up of three major elements:

1. An Advisory Council including representative of user groups, conservation interests, and enforcement specialists. The group would not exceed 15 members. It would insure a representation of the public interest.
2. A Legal Council to advise the Advisory Council on Federal laws and interpretations of laws.
3. A Division of Recreation that would be responsible for furnishing technical information to the Advisory Council, Assistant and State Directors and assembling data into (a) policies, (b) regulations, and (c) legislation.

[2.] These data would be recommended by the Systems Organization.

[3.] Natural recreation resources are the "raw materials" of outdoor recreation. They include climate, geologic character of the land, plant and animal life. The amount of the natural resource available will determine how much and where a recreation activity can take place. Therefore, a detailed resource inventory must be developed before a construction program is started.

1/ Numbers in boxes are keyed to those in the flow chart.

4. In addition to the 19 areas already studied, manpower and funds will be needed to inventory lands falling "outside" of the areas selected for recreation development.

5. Analyze trends that affect use; These include (1) sharp rise or fall in the birthrate (2) shift in urban population (3) increasing leisure time and (4) higher incomes.

6. Analysis of existing and potential demands is essential to the success of the system. The term "potential" takes into consideration the desire and ability of people to participate in recreation activities.

7. The tentative program will be brought together here and before further action can be taken, various criteria will have to be developed for use in later planning. Examples of such are; facility design standards, desert wilderness criteria, interpretive objectives and standards and many others.

8. Cooperative planning is required if recreation goals are to be attained.

9. In facility planning there is a great number of planning levels to deal with. Possibly the first is the identification of sites or areas where recreation facilities can or should be located. Another consideration is whether access should be made available in all cases. Open space is a positive and functional land use that should be designated and planned for. Building locations will have to be another consideration in the overall plan.

[10.] Special studies include administrative facility studies, and special underground water studies to determine the availability, quantity, and quality of water in certain areas of the desert.

[11.] Consultants could be called in to give expert advice on special situations.

1/ PROGRAM OPERATION

[12.] Besides the normal operation, maintenance, and management phases of an on-going program, a sound public information program is required.

[13.] Management of the recreation program has to be coordinated with the other resource programs in the desert.

[14.] Operation and maintenance of recreation facilities is one of the more pressing problems facing government agencies today.

1/ The remaining three phases relate directly to the operation of the recreation program and are not direct planning functions. However, they are part of the total system.

Benefits

The benefits to be realized if the recommendations of the California Desert Study are put in effect cannot be determined in dollars and cents alone. For example, the heavy recreational use of unique geological, botanical, archaeological, and other high interest areas is resulting in destruction and deterioration of recreation resources which could result in total loss of these values for future generations.

Additional benefits would be realized through the economic impact on the southern California Desert area as a result of expenditures by recreationists for goods and services.

THE LAND RESOURCES

Land is not usually emphasized in natural resource production and utilization. But it is an important entity--particularly within the California Desert, where burgeoning populations are exerting dramatic and often unusual pressures. As a resource, land can be analyzed in terms of specific use potentials. The quality and magnitude of these uses are directly related to population--its distribution and its characteristics.

In this report, land uses are largely those uses which require implementation by the private sector, but coordinated and planned by governmental units; that is, the implementation of land uses requires title transfer, lease, permit, or tenure adjustment.

The more common land uses that have a significant impact on the Desert can be broadly categorized as: (a) urban-suburban; (b) public purposes, (c) residential; (d) commercial; (e) industrial, (f) agricultural. Land is also required to fulfill special functions of governmental units. These land requirements can be categorized as: (a) military, (b) State of California, and (c) natural resource agencies.

In an attempt to better understand and analyze the over-all land use requirements on a district-wide basis, the BLM has developed three inventory and planning approaches. None of the approaches was specifically designed to deal with the unique desert environment. Each can serve only as a supplemental source of data in the "California Desert Study." Except perhaps for the classification program, none of the three approaches has made sufficient progress to be of significant contribution to the Desert Study.

INVENTORY APPROACHES

Land Classification.---This approach serves to determine which public lands should be kept for multiple-use and natural resources management and which lands should be title-transferred to private ownership. More than 8,[illegible]1,0[illegible] acres of public lands in the Desert Study Area have been classified for multiple use management and about 300,000 acres are expected to be classified for title-transfer (exclusive of exchanges) in the near future.

The classification program is designed to incorporate a maximum of public discussion and of local government participation. Land classification decisions are based on (a) a complete analysis of public and governmental participation, and (b) over-all land use and natural resource needs based on the best available information. Land classifications are intended to be fully flexible, consistent with the changing desert environment. And they are generally considered to represent only a "first" look into a fully integrated land development, utilization, and management system. The classification program has perhaps established a framework for the stable tenure of the public lands, at least during the foreseeable future.

Unit Resource Analysis.--The unit resource analysis (URA) is designed to be an inventory of both land and natural resources. URA is to be developed within small areas known as planning units. The Desert Study Area holds about 13 such units, and portions of two other units. It consists of a narrative and a system of overlays which depicts the present land and resource situation and opportunities for future development and management. Only two planning units, or about 1,200,000 acres have been analyzed within the Desert Study Area.

Management Framework Plan.--This plan is designed to incorporate basic data from the unit resource analysis into a fully coordinated plan for land and resources management. It consists of a narrative and a system of overlays which depicts various management programs

within the Desert Study Area is being planned under this approach.

LAND USES

Urban-Suburban

Urban-suburban use of Desert lands includes all land uses which are common to and characteristic of urban-suburban areas, i.e., residential, commercial, industrial, and appurtenant land uses, such as roads, power lines, parks, open space areas, etc.

The Desert Study area includes eight urban or partially urban regions: Ridgecrest, Barstow, Victorville-Apple Valley, Yucca Valley-Twentynine Palms, Needles, Blythe, Coachella Valley (Palm Spring-Indio), and Imperial Valley (Calexico-El Centro-Brawley).

Over the past 10 years, about 30,000 acres of public land have been title-transferred within or closely adjacent to urban-suburban areas. These lands were largely developed for residential use and public purpose uses, such as local parks, schools, sewage treatment sites, and rubbish disposal sites. The areas served by the land transfers were Barstow, Victorville-Apple Valley, Yucca Valley-Twentynine Palms, and Coachella Valley.

The future demand for and BLM's ability to supply needed urban-suburban land has not yet been studied in detail. Areas where the majority of transfers were made in the past will probably require increasingly more transfers of urban-suburban land in the future. Any desert urban study should pay special cognizance to protection of scenic values and the need for open space land. The timing of public land disposals must relate to the intensity and density of nearby developments.

The most active area could very well be Coachella Valley which has a restricted supply of land [redacted]. Growth projections indicate that nearby public lands may offer a partial solution to the problem.

In studying regional aspects of future desert urbanization, some thought should be given to the need for new communities or cities. By 1985 it may prove desirable to direct urbanization into totally undeveloped areas.

Public Purpose Uses

Public purpose uses are those which generally are provided by government and in certain instances by non-profit organizations. For the purposes of this report, these uses are considered to fall outside of urban or suburban areas. They include parks, schools, hospitals, open space areas, municipal water districts, sanitary facilities, and fire stations.

Over the past 10 years about 20,000 acres of public land have been title-transferred in the Desert Study Area for public purpose uses. The majority of these lands have been in the vicinity of populated areas. The lands have been largely developed into parks, rubbish disposal sites, and field biology centers under the auspices of various schools and universities.

Projections of future public purpose needs and land requirements are not now available, although some data were obtained in the land classification program. The present and future effect of providing large desert areas for preservation and study of ecological factors needs thorough consideration.

Additional title transfers probably will be required to supply necessary public purpose services as the desert population continues to grow.

Residential

For the purposes of this study "residential use" is considered to include cabin sites or rural recreational retreats, particularly in the form of 1-1/4- to 5-acre tracts.

During the past 10 years some 50,000 acres have been set aside under the Small Tract Act for small acreage recreational homesites. And during the 1950's even greater acreages were sold. The largest concentration of Federally sold recreational homesites lies in the Desert valley area extending from just east of Twentynine Palms to Victorville. Lesser concentrations are near Barstow, Palm Springs, and Ridgecrest.

As a result of the great land sales in the 1950's and early 1960's there are an estimated 120,000 unimproved, small, privately owned parcels in the Desert today. From county projections, these parcels appear to be ample to accommodate the need for rural homes over the next 50 years.

In 1960, sales of small tracks received such heavy criticism from local governmental bodies that the program was deemphasized. And today it is virtually non-existent.

The sale of small tracts resulted in fragmentation of public land in the Desert Area between Twentynine Palms and Victorville into scattered, small parcels. In these areas, periodic sales of land probably will occur, not necessarily to satisfy homesite

demand but rather to eliminate the administrative burden of these parcels in public ownership.

Commercial

For the purposes of this report, "commercial" means those uses which lie beyond the limits of urban-suburban areas and which are thought generally to include restaurants, gas stations, motels, resorts, stores, airports, and other service oriented establishments, most generally catering to tourists.

As can best be estimated, few public land sales or leases in the Desert Study Area over the past 10 or even 15 years can be attributed to commercial demand. Most commercialism has developed within urbanized areas and has relied on sales of private lands.

Future commercial development beyond the sphere of existing communities will depend largely on the location of transportation routes, expansion of recreational facilities, and growth of industry, and availability of water. Some thought has already been given to future planning for commercial development of key on-off ramp sites along major freeways.

There is a lack of information and projections as to future commercial need and placement within the Desert Area.

Industrial

Industrial use in the Desert Area has in the past been largely devoted to the mining and processing of various mineral material. Some of the larger mineral operations in the Desert include the Searles Lake bed deposits at Trona, rare earth deposits at Mountain

Pass, limestone deposits at Lucerne Valley, and iron deposits at Eagle Mountain.

Relatively few public-land patents have been issued under the mining laws over the past 10 years. Because of improved exploration methods, it is expected that new mineral deposits will be found and developed in the not too distant future. It is estimated, however, that mineral production areas will not exceed one-fourth of 1 percent of the total public land area.

Another aspect of industrial use of land is the growing need for rights-of-way to serve power lines, pipelines, highways, and communication facilities. Public land requirements for rights-of way have doubled in the Desert Area since 1964. It is estimated by 1975 the land requirements will have more than doubled again.

Studies have not yet been made of the industrial impact on the fragile desert environment. Such studies should be made to plan for the proper location and placement of uses requiring rights-of-ways. Rights-of-way corridors could result in land savings and economy.

Agriculture

Desert agriculture is largely confined to Coachella Valley, Imperial Valley, Palo Verde Valley, and to a lesser extent, in the Barstow, [redacted] and Winterhaven areas. These areas represent only 4 percent of the total Desert Study Area.

Public lands transferred over the past 10 years under the agricultural land laws have been relatively minor. They have been largely confined to areas adjacent to developed agriculture, such as in

Imperial and Palo Verde Valleys. Some agricultural transfers have also been made in remote areas such as Chuckwalla Valley.

The principal deterrent to new agricultural development is lack of water. Any new water importation to the Desert Area will likely be used for urban rather than agricultural purposes.

Numerous Federal, State, and County publications discuss the economic, water, soil, and climatic factors that deal with agricultural development in the Desert. These data have not been analyzed in total, on a regional basis, in light of any over-all land management plan.

Special Requirements

Military.--Among the governmental units having special requirements for public lands, the military services have probably exerted the heaviest impact on desert land utilization. Within the study area are six major military reservations totaling nearly 3 million acres.

Because of public sentiment, it is not likely that additional acreages will be withdrawn or acquired for military purposes. Instead land outside and adjacent to military reservations probably will be used for any testing of long range or special ordnance devices. Use of land for this purpose has been authorized in the past by special permit on a temporary basis. It is expected that future authorizations will also be by permit.

Projected military land requirements have not been inventoried by reservation or for the total desert area. The extent of land use conflicts should be determined as well as whether or not acreage economies can be effected.

State of California.--The State of California has two broad land acquisition programs which from time to time affect the Desert Area:

(1) public lands which are Federal obligations to the State, and

(2) public lands (generally under the Recreation and Public Purposes Act) for State recreation or public purposes facilities or areas.

The Federal obligations to the State total about 93,000 acres. Seventeen thousand acres can be transferred under indemnity selection statutes. The remaining lands are unsurveyed school sections (sections 16 and 36) which will be transferred to the State upon survey. It is not expected that all this acreage will be within the desert area.

In addition, the State has thousands of acres of [redacted] school lands within military reservations that it wishes to sell to the Federal Government or exchange for public land of equal value outside the reservations.

The second acquisition program involves large desert areas which the State has expressed serious interest in acquiring for recreational, scientific or historical purposes.

The State of California and its land programs could have a sizable impact on the California Desert. The full extent of this

program needs current review, particularly in terms of future land requirements and possible conflict with other uses.

Natural Resource Agencies.--There are special demands for desert land by the BLM and other Federal agencies for exchanges of land to complement Federal land acquisition programs, such as land in BLM management areas, in National Parks, National Monuments, National Seashores, and National Forests.

It is expected these exchange programs will expand far beyond present activity. Their potential extent and impact have not been fully explored at this time, however, a projected 1/2 million acres of public desert land could be involved in exchanges in the foreseeable future.

INVENTORY NEEDS

To determine fully the importance of the land resource, it will be necessary to commit a sizable effort towards inventory and planning.

The more important needs in inventorying are:

- Urban-Suburban: Study future urban land requirements in relation to available public land adjoining existing communities, particularly in the Coachella Valley. Study the need for new urban areas and their location.
- Public Purpose Uses: Study requirements for public-purpose land based on projections by qualified governmental units and non-profit organizations.
- Residential: Determine and study select areas where there may be a need for rural homesite development. Develop plan

for numerous scattered, small public land parcels in sections fragmented by the small tract program.

•Commercial: Study the need for additional commercial facilities and their proper placement particularly in relation to transportation routes and recreation use of the Desert.

•Industrial: Inventory the future need and location for all types of rights-of-ways, particularly in light of acreage economy and common rights-of-way corridors.

•Agriculture: Coordinate findings from the numerous publications on desert water, particularly for application to areas where soil and climatic factors are conducive to agricultural development.

•Military: Determine the need and impact of future military land requirements. [redacted]oint use of areas by different Services or forces may be appropriate.

•State of California: Investigate the over-all impact of all future desert land acquisition programs by the State.

•Natural Resource Agencies: Inventory the need for land exchanges and BLM's ability to supply exchange transfer land[redacted], in light of other transfer programs.

THE PROTECTION PROBLEM

Unless the Desert traveler knows about the potential hazards, his visit can be disillusioning--even perilous. He should know that roads off the main highway are generally in poor condition and improperly maintained. Service stations are few and far between. Water is scarce. Communication is poor. Back roads are rarely if ever patrolled. A stalled vehicle can mean disaster. Flash floods swirling through narrow mountain canyons endanger the unwary. Other hazards include mining shafts and excavations, abandoned structures, and polluted water.

And then there is the people problem--the few visitors who disregard the safety and welfare of others, who prey upon, disturb, and victimize other visitors. Contemptuous of the Desert's natural beauty, priceless scientific, educational, and historical features, they harass visitors, shoot garbage cans and signs, burn fan palm trees, pink gas pipe lines and power transmission line insulators, rustle cattle, smuggle, trespass on decorative stones, blow up campground outhouses, paint rocks, and commit other forms of vandalism, larceny, and assaults. As a consequence of these acts, some visitors are injured by falls, vehicle collisions, and other accidents. And a few may die.

The actual number and types of offenses committed in the Desert are not known. The Bureau has few observers and does not systematically maintain records. The general public often fails to report even major crimes. On the basis of records from Joshua Tree National Monument, BLM observations, and State law enforcement officers' statements, an estimated 500 major crimes and 1300 lesser offenses were committed in the Desert Area in 1968.

An adequate system to protect people from hazards and resources from damage is needed. And without it, a desert management program will be largely ineffective. Visitors need to be educated about the wise use of desert resources, and about how they can protect themselves. Cooperation, persuasion, and education are the key elements to any such program. And when they fail, it is necessary to rely on law enforcement.

This report describes the needs for protective services in the Desert at three levels of management for recreation: (a) present level, with practically no recreation development, (b) level envisioned in "The California Desert Study," and (c) level in which recreation is developed to handle short-range needs (1975).

PROTECTION SYSTEMS COMPARED

Besides the Bureau, two other Federal agencies have major responsibilities for land next to or within the California Desert. To measure the Bureau's protection of people and resources in the Desert, the protective systems of the U.S. Forest Service and of the U.S. National Park Service are described and compared.

Forest Service

Two areas make up the San Bernardino National Forest: 250,000-acre San Jacinto Mountains, and the 365,000-acre San Bernardino Mountains. Visitors throng to the Forests throughout the year, but most extensively during summer until after Labor Day. They have access to a visitor center, 73 campgrounds, 15 picnic areas, 38 organization camps, a swimming area, 8 lodges and resorts, and 6 winter sports areas.

Recreationists spent about 6 million visitor-days at the San Bernardino National Forest each year. Visitors are increasing in number at the rate of 5 to 6 percent per annum. Many recreation residents live in 1,700 cabins located on 46 USFS land tracts. one day Capacity is about 47,000, and will increase to about 52,500 when the Cedar Springs Dam is constructed and developed.

Traffic control within the Forest ia a major problem aptly handled by the 13 resident California Highway Patrol officers. During summer, up to 18 officers are on duty on the Forest. Their prime duty is traffic law enforcement. They cooperate fully with the Forest Service and county sheriffs and are in direct communication with them.

To uphold State, county, and local ordinances within the Forest boundary, the Riverside County Sheriff has deputies at Idyllwild in the San Jacinto Mountain Area, and the San Bernardino County Sheriff has deputies at Lake Arrowhead and Big Bear Lake in the San Bernardino Mountain Area. Lake Arrowhead is protected by contract, and besides regular protection responsibilities, the sheriff provides boat patrol and rescue services.

Law enforcement responsibilities on the San Bernardino National Forest are held by the highway patrol officers and sheriff's deputies and by 45 USFS officers--30 Fire Prevention Technicians and 15 in the recreation field. Some of these Forest Service employees have peace officer appointments under State law, but none carries guns. And all are discouraged from making arrests even though authorized to do so. Law violations include smoking or building campfires in the wrong places, entry into fire closed areas, camping without paying day use fees, and using chain saw and bulldozer equipment improperly.

Forest Officers are authorized to arrest, without warrant, any person ~~taken in the act~~ of violating the laws or regulations relating to the National Forests. Furthermore, if an officer observes a violation of a Federal law or regulation constituting a felony or misdemeanor, he can take the offender into custody without obtaining a warrant--if this can safely be done.

In spite of year-round heavy recreation use of the San Bernardino National Forest, protection problems are adroitly handled because of the joint State and Federal protection system. Law enforcement personnel function as a team, are well coordinated, and have the full support of the local judges and U.S. Commissioners.

National Park Service

The 557,000-acre Joshua Tree National Monument of the National Park Service has a somewhat different protection system than that of the San Bernardino National Forest. Rangers are the responsible law enforcement officers. The California Highway Patrol, sheriff's offices, and California Division of Forestry assist only as requested.

Permanent Joshua Tree National Monument law enforcement personnel total seven: a Chief Ranger, three District Rangers, and three Park Rangers. They can arrest violators and are authorized to carry firearms. Besides law enforcement, Ranger duties include traffic management, rescue, inspection of public facilities, and safety. The California Division of Forestry assists in the suppression of fires.

Bureau of Land Management

The BLM does not have a protection system for the Desert lands it administers. Funds, personnel, equipment, and facilities are practically

non-existent. Law and regulations are inadequate. Rules and regulations are unenforceable. Inventory of hazards and resource values is yet to be done.

Scattered across the 11 million acres are at any one time a handful of Bureau administrators, maybe 1 per million acres. Occasionally along main highways California Highway Patrol cars pass by. Sheriff's deputies are scattered wide and far around the edges of the recreation study area. The Bureau has 5 one completed campgrounds in ~~Owl Canyon,~~ the Desert area, [redacted], which are watched over by two part-time employees

Bureau employees are not trained in law enforcement, make no arrests, are not authorized to carry or use firearms in performance of duty, can cite no one for Federal law or regulation violations other than by Notice of Trespass, and cannot bring petty offense violators before a U.S. Commissioner. Bureau employees must take violators of civil and criminal Federal laws to Federal Court through the U.S. Attorney regardless of how serious the offense. The simplest action may take a year or more to conclude. Protection coordination with State law enforcement offices is limited and generally by telephone.

Public land recreation rules and regulations became effective on January 18, 1969. Their purpose is to provide for protection, enhancement, and management of outdoor recreation resources and natural values and for public use of the outdoor recreation resources of the public lands. The rules and regulations are limited. Legislative authority is required for enforcement. Until such legislative authority is provided, the Bureau must use cooperation, persuasion, and education to make the rules and regulations work.

State and Local Agencies

The State has concurrent legislative jurisdiction with the United States on lands administered by the Bureau in the Desert Study Area. Therefore, it can enforce State and local laws and ordinances on these lands.

California Highway Patrol is primarily concerned with the safe, proper use of the highways within the State and with providing assistance to the motoring public. In the Desert, its duties are usually performed along main highways and not in the back country.

California Division of Forestry has a number of fire guard stations west of the Desert Study Area. By Bureau request the Division helps suppress fires on Bureau lands. Costs are reimbursed.

California Department of Fish and Game enforce State laws relating to the protection of fish and game. Its wardens have the powers of a peace officer to make arrests for the violation of state laws. And they are deputized by the U.S. Fish and Wildlife Service to enforce Federal fish and wildlife laws.

PROPOSED PLANS

Inventory

To plan for protective services, it is necessary first of all to identify high risk areas in the Desert--areas valuable or dangerous or both to the visitor. Knowing where these high-risk areas are is vital in protection planning and in day-to-day deployment of forces to minimize risks.

The elements to be inventoried include hazards, transportation, communication, and recreation facilities, water, services, natural, scientific, historic, and educational values, and damage to resources.

After data are gathered, map overlays can be prepared to show the existing situation and the planned situation as related to time, i.e., a planned campground and its expected completion date. One of the prime end products of this inventory is the location of risk areas on overlays. This information permits a system of planning for minimal risk protection. And, by keeping abreast of daily risk changes, i.e., a new motorcycle event, protection forces can be deployed to minimize any additional risks.

The map overlays also reveal conflicts, duplications, planning needs, and potential problems. This knowledge, too, is of prime importance in planning protection services.

Planning

Short-range planning from the present situation to the year 1980 is preceded by the proposed comprehensive inventory. Planning then is directed towards collecting inventory data, eliminating hazards, developing policy and objectives, determining organization and duties, obtaining enabling legislation, writing procedural manuals and guidelines and training personnel.

Hazard reduction can be handled by contract for such actions as fences, fill or block drifts, excavations and shafts, repair or sign road hazards, install road guard rails, trail and road warning signs, water hazard signs, fill or cap wells, and destroying hazardous, abandoned structures.

For long-range planning by the year 2000, 50 million visitor-days may be spent in the desert on public domain, if the desert is developed and managed at the level envisioned by The 1968 California Desert Study. This study sets forth five recommendations on protection:

1. Uses that detract from the appearance of the Desert should be regulated.

2. The recreation resource should be protected.

3. Public contact and surveillance should be by BLM desert rangers on a day-to-day basis.

4. Visitor services should be provided at a Desert Center and strategically located Way Stations.

5. The Desert should be kept clean.

The protection system recommended is based on a mixture of systems used by the San Bernardino National Forest and by the Joshua Tree National Monument. Like the ~~United States Forest Service~~ practices of the U.S. ~~(Forest)~~, law enforcement would be a coordinated team effort by private, state, and Federal officers.

Under the district manager, a protection branch is established. The protection organization is planned by BLM with guidance from professional protection consultants. The protection organization is developed to adequately protect desert visitors and resources and expands with recreation feature identification and facility development.

If legislation is enacted to grant to the BLM law enforcement authority, i.e., law enforcement personnel empowered to arrest and carry and use weapons, [redacted] and certain [redacted]

district field personnel need to be trained. State peace officers, and professional consultants can provide guidance in developing the protection training program.

BLM law enforcement officers to be called Rangers, would be empowered to arrest and to carry weapons. Their duties would approximate those of the National Park Service Ranger. They would be trained and organized to handle normal search-and-rescue operations, disturbances, and disasters.

Chain of command would flow directly from the District Manager to the Chief Ranger, who has charge of the total protection program. He would be responsible for traffic management, law enforcement, fire protection, and protection support. [redacted]

A Ranger's duties include fire control, visitor protection, natural resource management, search and rescue, inspection of public facilities and safety. Generally, Rangers would be college graduates in resource management, or educated in a 2-year college with a major in police science and practical law enforcement experience.

Transportation facilities available to the Ranger staff would include an airstrip with lights and directional vane located at each Way Station and Bureau-owned aircraft for search and rescue, patrol, emergency personnel transport, fire spotting, and management. [redacted]

The Bureau would prepare emergency plans to handle major incidents, i.e., riots, natural disasters, airplane crashes, floods, and major rescue efforts when multiple deaths and injuries occur. Local, state, and Federal responsibilities are worked out in advance.

Other protective measures that the Bureau should take includes registration and signing. A voluntary registration and check-in system at each Way Station and Desert Center would help the Ranger keep track of visitors. Electronic traffic counters would be located at strategic road intersections in the Desert to assist Rangers in determing where people are going. Hazards are signed. Most important, Desert roads are numbered and signed at intersections. This enables proper road identification on desert maps.

Information handouts should be developed. They would cover such subjects as "Rules for Dune Buggy Drivers in the Imperial Sand Hills,," "Motorcycle Routes of the Desert," and "Cima Dome Wildlife." They are also a means of determining where visitors are going, and of warning them of potential hazards.

THE COMMUNICATION PROBLEM

An efficient communications system is at the heart of any management system. It becomes increasingly mandatory if the elements of safety, public welfare, and damage potential are present. In the California Desert, all of the following considerations are present and require rapid, dependable means of communication:

- Vast expanses of terrain are involved.
- The area is generally accessible to the using public, and visitors range widely.
- Many hazards, natural and man-made, exist.
- Except in limited areas, there are no means of communication.
- The number of management personnel is small.
- Opportunities for crime and material damage to irreplaceable resources are great.
- Climatic conditions are severe.
- Management must be keyed to rapid communication in the

As the Bureau steps up the tempo of its activities in the Desert, it will increasingly become involved with the health, safety, and general welfare from 5,000,000 and 50,000,000 people a year. It is already charged with the management and protection of public resources.

Electronic communications are the only practical and economically attainable method of covering the California Desert. Because of the distances involved, and the configuration of the mountain ranges, a sophisticated radio network seems to be the best choice. Most of the

radio communications now in operation are directed toward the major highway access routes, but they would be only of limited value to the development of a desert network. In setting up a network, other problems would have to be overcome. Power sources are not generally available. Key radio transmitter sites may be nearly inaccessible. And extreme heat may jam the equipment.

PRESSING NEEDS

The pressing need for a radio communication system is suggested by these facts:

1. At least one search and rescue mission is needed each week. In areas where temperatures consistently exceed 100 degrees for 5 months each year, this condition can become an urgent matter of life and death--not only for the public--but also for Bureau employees. And we are now actively encouraging people to use the Desert

2. Many hazards in the Desert threaten the health and safety of the visitor. They include poisonous reptiles, abandoned mine workings, cliffs, dangerous roads, flood areas, and severe storms. Should an accident occur a rapid communications system becomes critical because often minutes count in getting help at the scene.

3. Resources must be protected from destruction either from natural causes (fire, flood, etc.) or from human activity. There is a fire potential on more than 2,000,000 acres of the Desert.

4. Public service requires fast, accurate answers to visitor's questions. For example: Are there any open camp spaces in Owl

Canyon? How is the road over the Cima Dome? Are the spring flowers in bloom along Lucerne Valley Road? The requests for advice, directions, assistance, and aid beyond the emergency catetory is already overtaxing present facilities and personnel.

5. Sanitation requirements require close coordination of the maintenance crews that can best be achieved by rapid communications. There would be no need, for instance, to send a dump truck to a lightly-used campground, or a pickup to a heavily littered area. Any litter or trash buildup cannot be tolerated for public health reasons.

6. Preliminary studies suggest that major crimes are committed at the rate of about 1 percent for every 1,500 visits. Minor crimes in the Desert include off-road vehicular violations, trespassing, destroying property.

7. Vast areas of the desert are contaminated with unexploded ordnance devices from World War II training exercises. To patrol adequately these areas, warn the using public, and perhaps rescue or aid them would necessitate a rapid means of communication.

RECOMMENDATIONS

Frequency Band

The Bureau of Land Management is now using frequencies in the 163 to 174 Mega-Hertz Band for mobile communications in all states. This band is not subject to skip interference, and should be used for base stations, mobiles, and portables in the Desert. The 25-50 Mega-Hertz

Band provides greater coverage areas per base station or repeater in regions with advantageous soil conditions, but it subject to skip interference. In most of the California Desert, the soil conditions are not advantageous for radio propagation and the 163-174 Mega-Hertz Band will provide coverage equal to the 25-50 Mega-Hertz Band. Frequencies in the 406-420 MHz Band can be used advantageously for point-to-point operations to control the base stations.

Radio System Operation

To achieve communication throughout the California Desert with a reasonable number of fixed stations would require a substantial increase in communication efficiency over the 5- or 10-mile range of portable or mobile communications. This greater efficiency can be obtained only by using fixed stations with effective antenna heights many times greater than the 5 or 6 feet obtained with the typical mobile or portable antenna installation.

Even with the most advantageous location of fixed stations, a number of base stations with remote radio links and quite a number of repeaters will be required to obtain the needed communications.

The recommended radio system design should include some practical means of repeater selection to prevent interference produced by the simultaneous operation of two adjacent repeaters. Repeater control can be achieved by changing the channel frequency or by using a common repeater channel with tone selection of repeaters. The tone system can be implemented with audible or sub-audible pulse or continuous tones. The pulse tones can be binary or decimally

coded, low or high speed. Using multiple channel frequencies for repeater control is difficult to justify with the growing shortage of channel frequencies. Any scheme is difficult to implement with personal portables. Besides being the simplest and most economical, the single-audible-pulse-tone method is probably easiest to implement in personal portable radios. Therefore, the California Desert System should be based on the repeater selection system.

Location of Radio Stations

Picking advantageous locations for the base stations and repeaters can greatly reduce the cost and complexity of a radio system.. The key factor is the effective antenna height at the fixed station site. This effective height depends not only on the altitude of the site, but on how prominent the site appears to the surrounding area. An ideal site would be a lone mountain peak. But if this same peak were surrounded by other peaks, the other peaks would form a shield, reducing the effectiveness of the central peak. Mountain ranges in parallel rows, as in the eastern desert, pose a similar problem. A station on one range would cover the near faces of adjacent ranges, but the far faces of adjacent ranges would be shaded. And the range with the station would be low lengthwise of the range. To provide coverage in this mountainous terrain, stations must be closely spaced in a grid so that each mountain range is covered from more than one direction to minimize dead spots. A 40-mile grid probably would yield a reasonable approximation for estimating costs.

Riverside District.--For the Riverside District, we recommend three base stations: (a) on the north side of the San Gabriel Mountains to serve the northwest portion of the Mojave Desert; (b) east end of the San Bernardino Mountains to serve the balance of San Bernardino County to the Nevada border; and (c) the Santa Rosa Mountains on the west side of the Imperial Valley to serve the balance of the Southern portion of the Desert Study Area. Owing to the multiplicity of mountain ranges in the Desert, it will be necessary to supplement each of the three Base Stations with about six repeaters. While it might be possible to reach the San Gabriel and Santa Rose Base Stations with single path 400 MHz links from the present Riverside District Office locations, it would not seem possible to reach a base station on the east end of the San Bernardino Mountains with a single path 400 MHz link unless the base station was located on the 10,000-ft. ridge in the San Bernardino National Forest Wilderness Area.

Locating a base station in a Wilderness Area would not seem wise due to the opposition likely to be encountered and the difficulty maintenance would pose with only helicopter or pack animal access.

Bakersfield District.-A single base station already planned near Chimney Peak in the Sierra Nevada could be supplemented with about

four repeaters to serve the north end of the Desert Study Area. This base would be served by a two-path 400-MHz link from the Bakersfield District Office.

Of the recommended equipment, two of the 400 MHz link sets have been ordered. The base station, a repeater, and the other two 400 MHz link sets are programed for future construction. About three remaining repeaters need to be added to this to cover the Desert Study Area. Additional equipment would be needed to complete the District coverage outside the Desert Study Area in the Riverside District and possibly in the Bakersfield District.

System Design Procedure

The sequence of actions in designing a radio system for the Desert would include:

1. Prepare tentative system drawing showing area of coverage, frequencies desired, and mode of system operation for Washington Office review.

2. Revise system drawing to reflect choices after test, evaluation, and final selection of sites. Prepare profiles and submit to Washington Office for review and frequency assignments.

3. Design necessary antennas, support towers or poles, and building, housing, or vault for equipment at each site. Include lightning protection as needed. Include power wiring and if commercial power is not available, design power system.

4. Design electronic equipment for each site, matching equipment to available power supply at each site.

5. Design access vehicle trails or improvements to existing roads as needed at each site. Savings could be realized by

coordination with recreation site road program and other road programs.

Radio Site Selection Procedure

A suggested procedure for the selection of the base station, control link and repeater sites would involve:

1. Inventory all communication sites in the Desert Study Area, together with the adjacent area overlooking the Study Area and control-link paths from the Riverside and Bakersfield District Offices to possible base station sites.

2. From relief maps, pick the present communication sites most suitable for BLM use. If available, several alternates should be selected for each point where a BLM station is needed. Also pick likely sites for areas where there are not any sites in use, and pick likely unused alternates for areas where the present communication sites appear inadequate or do not provide alternates.

3. From detailed contour maps and aerial photographs (where available), evaluate all sites for present access and cost of improving access. This process should still yield several alternates near each point where a site is desired. The selection should be coordinated with the recreation and other road programs.

4. Check status of all remaining sites and obtain permission to test from land owners or land managers for sites other than Public Domain.

5. Test all sites by using a portable base station at each site and four vehicles equipped with portable radios and external antennas.

6. Evaluate and select final sites on Public Domain and other Government land where occupancy can be assured. Negotiate for occupancy of other sites on private land or Government land subject

THE TRANSPORTATION PROBLEM

In the California Desert, the transportation network has grown from a few native trails to [redacted] proliferation of freeways, highways, and byways that blanket the some 16 million acres. At first glance it may appear that this system adequately provides for the needs of the area, but closer study reveals many deficiencies in the location and construction of roads.

1. In some cases many years of use on an unstabilized surface has resulted in a loss of several feet of material. The road becomes a trench, resulting in unusual maintenance and of greatly lessened value as a recreational route.

2. Infrequent maintenance with the resulting poor riding surface has led to the development of parallel trails. At times three or four trails will develop, with the rider selecting the most comfortable. The resulting scar on the land detracts greatly from the natural beauty.

3. The existing desert roads generally take the shortest and easiest route between two points. While this is necessary on major routes, it is neither desirable or necessary on the bulk of the system

4. Unwise use of the land has destroyed much of the natural beauty of some sections of otherwise scenic routes. Some routes have more than their fair share of "Small Tract" architecture and power lines, and some rerouting will be necessary to regain a desirable environment.

5. Existing transportation planning by the state, counties and the Bureau of Land Management has been done without the benefit of detailed resource inventory and planning. Without this detailed planning there is no assurance that a facility constructed today provides

adequate protection for the resource or that it will adequately serve the resource in the future.

6. There is no coordinated approach to the establishment of scenic highways and parkways. At least two state agencies, four of the counties in the study area, and one inter-county group have made recommendations for various types of scenic routes. The only designated scenic routes now within the study area are a short section of State Route 190 entirely within Death Valley National Monument and a shorter section of State Route 38 within the San Bernardino National Forest. All roads within the Death Valley and Joshua Tree National Monuments are managed as scenic routes, but the total mileage is limited.

Existing Bureau of Land Management instructions do not adequately provide for transportation planning of the scope required in this study. What is needed is the orderly development of a transportation plan for the California Desert.

PLANNING

The Bureau of Land Management is the principal landowner and manager in the California Desert. The location and construction of transportation facilities will have a heavy impact on the management of desert lands. Therefore, the Bureau should assume a more active role in transportation planning and coordination for the study area.

The general objective of transportation planning is to establish a system capable of accommodating all travel in an orderly, safe, efficient and economical manner. Three conditions influence this objective: (a) owing to the rapid population expansion in the Southern California area, there has been an unprecedented demand for a transportation

network within the Desert. (b) There is a great need for coordination and cooperation to insure wise development of the desert among governmental units engaged in planning. (c) And there is a continuing demand for obtaining the most benefit from each dollar expended.

PLANNING SEQUENCE

A logical sequence of planning steps should be established for the California Desert. The first step will be to select the classification system that will be necessary.

Highways

Functional System.--The most important method of classification for planning purposes is the functional system. In this system each component is assigned a class based on the expected use of the road. The freeway, for example, serves only through traffic. The primary system serves through traffic traveling inter-city or inter-county. The secondary system consists mainly of county roads serving smaller communities and adjacent areas. In the desert they will provide the primary means of dispersing the recreation traffic. The feeder system will comprise the largest segment of the desert highway system. In addition to providing access to the recreation areas, it should become a recreation destination in itself. Within the category of land access are included short access roads to interpretive sites, recreation sites, and service roads.

Other Systems.--Superimposed upon the functional system are several other systems established for administrative purposes. Administrative system is based on governmental responsibility for construction and maintenance. The Federal-aid system was established solely for the

purpose of distributing federal funds and the raising of design and construction standards. The National Interstate Highway system was established to provide continuity between the various state systems. And the United States Highway system was established to provide for numbering continuity from state to state.

Trails

A trail system in the Desert appears to satisfy two general demands. One is the desire to ride or walk for pleasure, and the other is the desire to compete against the desert environment. The demand for facilities is difficult to estimate, and a thorough study is needed.

The following classification system for Desert trails is suggested.

General Purpose Riding or Hiking Trails.--This system would be constructed to allow passage on foot or by two-wheeled vehicle. Grades would be gentle and routes would be selected to take advantage of the natural beauty of the area. This system would be developed in the more scenic portions of the Desert, usually in the mountains, and would generally be destination in itself. Natural or developed water supplies would be a desirable feature of this system.

General Purpose Vehicle Trails.--This system would provide selected cross-country routes for off-road vehicle use. Routes would be selected for varied terrain and minimum impact on soil and vegetative resources. This system would provide a retreat from the main transportation routes. Since the purpose of this system is pleasure driving, routes should not be too challenging. Desert washes would be used extensively.

Special Purpose Hiking Trails.--This system includes nature trails, access trails to interpretive sites, etc. They would be constructed

for foot traffic, and vehicular traffic would be prohibited.

Special Purpose Vehicle Trails.--Because of the growing interest in competion sport motorcycling in the Desert, it is evident that a system of motorcycle trails is necessary.

Another type of special-purpose which trail is intended to provide for maximum testing of the driver and his equipment. Separate facilities for two-wheel and four-wheel vehicles would be required, although two-wheel vehicles would be expected on the other routes.

Airfields

Airfields consist of airports, heliports, and helispots. The Federal Aviation Administration has developed a functional classification, based on expected use. At the time detailed planning is started, this classification should be studied and adapted to BLM needs.

PLANNING SURVEYS

The next planning step is to investigate all existing planning surveys to provide detailed, current information about the transportation system.

Inventory.--An inventory is made to obtain sufficient data to permit drafting of maps; the compilation of statistics on the mileage or number of the several types of facilities, the kinds of structures and other data; the evaluation of needs by allowing comparison with a standard; and a periodic evaluation of the adequacy of any component of the system.

In addition to the physical features of the roadway itself, some classification system for the cultural features adjacent to the roadway should be included. This could include such items as degree of urbanization, dump grounds, intrusion of power lines, scenic vistas, and

other factors which would add or detract from natural beauty.

Another category in the inventory should be critical features. This would include any features which may be hazardous to the traveler or which are outside the general design of the facility. An example would be a sudden sharp curve after many miles of flatter curves.

As part of the inventory process, a separate program to retrace and mark the historic trails of the desert should be established. When routes are determined, detailed maps should be prepared for public use.

Maps.--A series of maps for general distribution and charts and maps for special planning purposes will be needed. Both the state and counties maintain various maps in connection with their inventories which can be adapted to this use.

Traffic Studies.--Two types of traffic studies should be extended to the desert transportation system: (a) volume counts provide information on volumes of traffic using a particular facility and can be established to provide nearly any desired interval, and (b) origin-destination studies of the origin and destination which are basic to other activities in the Desert.

Determination of Needs

From results of traffic and other resource studies, projections of amounts of traffic and the assignment of this traffic to the various components of the system should be made. At this stage of planning, an inventory of potential conflicts is needed. Many resources could be harmed by an improperly established road or trail, and these should be identified and located on maps so that they may be avoided.

The next major planning step is the development of a transportation plan to satisfy the future needs of the area. Because of the

need to carry large volumes of traffic in the safest manner possible, it is possible to vary the routes and standards of the freeway and primary system only within very narrow limits. Protection of the roadside environment is important. An investigation of known future routes across BLM lands should be made and proper protection given these routes as soon as possible.The greatest need in desert highway planning includes the secondary and feeder classifications.

Any vacant public lands now may be appropriated for public roads under authority of R.S. 2477 without notification or application to the United States Government. These kinds of public land appropriations pose a serious problem to sound land management.

The BLM should undertake appropriate classification actions for those public lands that will remain in federal ownership so that road construction on them would require BLM approval of route location and standards. Only with this type of control can a comprehensive transportation plan for public lands in the desert be effective.

The feeder system will be the largest component of the system. The purpose of this system is to provide a pleasureable driving experience. To this end, the location and design must be most carefully controlled. The most scenic and varied terrain available should be utilized for this system. Care must be taken, however, to avoid destruction of the resources which make the location valuable. The road location must be sensitive to the environment. And the road should be well designed.

Future demand for trails is difficult to predict. The immediate need for a "catch-up" program in the area of competitive sport motorcycling is evident and should be given high priority. Beyond that,

much more data are needed and can be developed as part of the Phase III comprehensive planning effort.

The future need for airfields is poorly defined. As management becomes more intensive, it is expected that a need for Bureau of Land Management airfields will develop. The Federal Aviation Administration has a functional classification system and recommended minimum standards available, and its advisory services should be utilized.

PROGRAMING

The final step in the planning process is programing, which consists of determining priorities and planning an action plan. Both of these steps are keyed directly to the needs of users--especially users of the recreation resource. Construction and maintenance responsibilities for the various components of the transportation system should be determined early in the programing stage. Construction plans should include surface stabilization whenever possible so that future maintenance requirements do not become excessive. The next planning stage should include a determination of the feasibility and extent of Bureau of Land Management road maintenance in the Desert Area.

An adequately staffed and funded engineering organization should be established for the Desert Study Area. This organization would be under the guidance of a supervisory engineer and would provide all of the engineering services required for the detailed planning phase and would provide a nucleus for the development phase.

The resource area boundaries would be used to delineate responsibilities and it is assumed that the study area within the Bakersfield

District would be serviced from the appropriate Riverside District area headquarters. The planning organization could be established in two sequences: the first sequence would cover a 1-year period, and the second sequence, a 2-year period.

THE REALTY PROBLEM

A necessary part of any long-range plan for the California Desert is a provision for realty services. For such services form an essential ingredient of any land activity in the Desert. Realty services in support of other resources activity include exchanges of lands and acquisition of easements to assist management programs of the Bureau and other Federal agencies. Realty services to the public include acquiring public and administrative access to public lands as needs are determined by other resource activities.

Three major services to the public are (a) making public lands available for private needs under the public land disposal laws; (b) acting on less-than-fee grant applications for public lands, and (c) determining the public lands needed for retention and disposal under the Classification and Multiple-Use Act procedures, including lands needed for public purposes, whether they be in or out of Federal ownership.

Northern Desert

Two counties--San Bernardino and Kern--have developed general land-use plans for the Desert Study Area. A third--Inyo County--has not progressed as far. Disposal classifications in the San Bernardino and Kern County portions of the Study Area should conform to these general plans. Because the BLM Bakersfield District personnel indicated that the area around Mojave and the Owens Valley are heavily used for recreation and other uses, we recommend that these areas be added to the California Desert Study Area.

Southern Desert

The general plan prepared by Riverside County is adequate in deciding on general land use, but is probably not comprehensive enough in deciding on individual land tract use. A tract-by-tract evaluation should precede any land disposal classifications in this County. The Open Space Study prepared for the State of California, suggests that considerable acreages will be required in Riverside County for open space values. Various types of open space uses are identified in the Study and should be evaluated when considering any disposal classifications in the County. The northern Coachella Valley, for example, is considered to be a critical region where planning is now needed.

Imperial County planning lags behind that of Riverside County. Consequently, any disposal classification action should be preceded by comprehensive planning by the Bureau, as it is doubtful that the County has the resources to do the planning.

USES OF THE PUBLIC LANDS

Exchanges

The extent of a land exchange program necessary to support acquisition needs of other resource activities can be determined only after the individual activities identify their requirements. However, an estimate of the immediate recreation program needs based on the California Desert Study could be prepared if a Recreation Plan is adopted.

A different exchange program, not directly related to Bureau resource activities, will be required to provide a land base for exchanges with other Federal agencies. The California Desert Study estimates that about 10 percent of the public land in the Desert Study

Area will be classified for title transfer purposes by 1970. If this is the case, a good portion of this acreage will probably be classified for exchange purposes to aid other Federal programs. Of the approximate 1,000,000 acres potentially suitable for disposal in the Desert Study Area, probably anywhere from 100,000 to 300,000 acres might satisfy exchange proponents.

Agriculture

Less than 4 percent of the California Desert Study Area is devoted to agricultural activity. The bulk of this land is located in the Coachella, Imperial, and Palo Verde Valleys of the Colorado Desert. Principal deterrents to agricultural development are a lack of water and the poor quality of existing supplies.

Presently, nearly all of the lands being irrigated for agricultural purposes are supplied with low quality water from the Colorado River. Where groundwater supplies are being pumped, this has resulted in a mining of the supply and consequent lowering of the water table and eventual diminishment of agricultural activity.

The area covered by the California Desert Study includes two hydrologic study areas: the South Lahontan and the Colorado Desert. In 1972 the South Lahontan area will begin importing water from the California Water Project, and deliveries are expected to build up to about 215,000 acre-feet by 1991. Because of pressures of expanding urban areas, however, little water will be available for agricultural uses.

Because of the costs involved, supplies to be imported to the Colorado Desert from the State Water Project will be used primarily

to support the projected population growth and to improve the quality of Colorado River irrigation supplies. Thus, prospects for future agricultural development are practically nil in the Colorado Desert--even with full development of the California Water Plan.

Urban and Suburban Expansion

Present urban development within the Study Area is limited and scattered. Spillover from the Los Angeles Metropolitan Area and expansion of existing desert communities, however, are beginning to make urban inroads.

Public land needs for urban expansion are expected to continue to be limited as there is little public land that is available. However, there will be a limited number of public land tracts that will qualify. These tracts are usually covered by conflicting claims of various types, making their disposal difficult. Every effort should be made to clear the conflicts as quickly as possible to meet legitimate needs for these lands. Meeting these urgent legitimate needs should give the Bureau the support necessary to curb speculative pressures on other lands.

Commercial

Commercial development in the Desert Area has been dictated by location of transportation routes, mineral and recreation development, and availability of water. We foresee little change in these determining criteria in the future.

The task of reviewing transportation plans to determine the number of commercial areas which may be required on public lands and the evaluation of recreation development plans to assess commercial needs will require further effort. This work would best be accomplished

after transportation and recreation plans (plus any other resource proposals which will develop such as needs for commercial lands) are completed.

Industrial

Very little of the Study Area is devoted to industrial uses. Distance from markets, lack of water and limited transportation facilities are the principal reasons for this lack of development. Most of the acreage devoted to industrial use is the scene of mining activity. The potential for industrial development will probably continue to be closely tied to the processing of mineral extraction products. Water will continue to be an important consideration in locating industrial facilities on public lands. A careful review of prospective mineral developments should be made when the mineral inventory is complete to evaluate the proposals for meeting future industrial needs.

Withdrawal-Restoration

About 5,725,000 acres in the Desert Study Area are presently withdrawn for various types of use. Acreage of withdrawn land, by agency, is:

Agency:	Withdrawal (acres)	Total public land (percent)
Reclamation	835,000	8
Military	2,900,000	26
National Forests	690,000	7
National Monuments	1,100,000	10
Indian (various)	200,000	2
Total	5,725,000	53

The military and reclamation withdrawals are probably the most fertile field in which to expend review efforts to determine lands suitable for restoration to the public domain or areas where other uses might be permitted. Withdrawals for these two categories total about one-third of all public lands in the BLM District.

Rights-of-Way

The principal users of rights-of-way in the California Desert are utility companies--notably, public works, telephone, pipeline, lighting, road, water, gas and electricity, aviation, and development firms.

The BLM's Riverside District office reports the number of right-of-way cases in the California Desert as follows, by year;

1963	1964	1965	1966	1967	1968	1969 (to Jan. 1)
90	90	103	143	319	308	143

The Bakersfield District office estimates that it has averaged 10 this year for this period.

The large jump in cases between 1966 and 1967 represents emphasis being placed on review of charges for existing rights-of-way. About one-half of the totals for 1967 and 1968 are right-of-way reappraisals.

Residential

The bulk of the pressures for residential lands in the California Desert outside of expanding communities will be for desert recreational retreats. There is little need for release of public lands for development of any new acreages for this purpose. An adequate number of parcels are already available for development.

Because of the small tract program of the 1950's, a great residue of terminated leave and classified small tract lands remain in government

ownership. These tracts plus large numbers of undeveloped private lands should provide the bulk of the land base necessary to meet the demands for recreational type desert retreats. For example, San Bernardino County officials estimate that "there are approximately 120,000 unimproved small parcels in existence today--more than enough to accommodate the anticipated population increase there for the next fifty years. It is apparent, therefore, that it is unnecessary to encourage further subdivision of private lands or further release of Small Tracts of public domain which are still in large acreage blocks."

Special Uses

The principal user of public lands under Special Land Use regulations is the Department of Defense. Rather than seek withdrawals for military use, Special Land Use Permits are being used with increasing frequency. To determine the extent of this program and probable future needs, we recommend that permits granted over the past few years be reviewed. These permits should be tabulated and plotted on maps. Then, the military services should be contacted in an attempt to assess their future needs.

SPECIAL MANAGEMENT PROBLEM

The problem of what to do with the shotgun land pattern left with the retreat of the Small Tract program in the early 1960's remains with the Bureau of Land Management. In the more desirable, populated areas, sales of remaining unsold parcels under the Small Tract Act should clean up the land pattern. But in less desirable locations,

lands perhaps should be declassified from small tract status and offered under the several disposal acts--provided demand for the lands exist and they ary not needed for any multiple-use management program. This reservoir of lands may provide an excellent base for exchanges in other areas where the Bureau may wish to block up lands or to aid other agencies blocking up programs.

A third situation may also exist. In some areas, only a small percentage of an area has been patented under the Small Tract Act. Reclassification of these areas for retention in Federal ownership may be the proper course of action.

THE CONSTRUCTION PROBLEM

If the full potential of the Desert as a natural resource is to be realized, construction of facilities to meet expected demands is a must. The expected people pressure will make it necessary, [redacted], to provide supervision in the management of Desert lands to prevent their destruction. Consequently, it will be necessary to carry out cadastral surveys to identify boundaries--especially in areas of intermingled ownership.

CONSTRUCTION

Construction in the California Desert will include recreation roads, and other roads, interpretive sites, recreation sites, and way stations. Cost will include master planning, survey and design, construction costs, administration, and inspection.

CADASTRAL SURVEYS

About 40 percent of the cadastral surveys in the area of study, 11 million acres of public desert lands have been completed. The remaining 6 million plus acres require either an original survey or a resurvey. The survey efforts should be funded immediately and head count added to provide for advance planning during the first year.

Resurveys may be needed because of lost or obliterated corners that require reestablishment or because of partially or totally fraudulent surveys made during the period of 1870 and 1890. These surveys and loss of monuments, by and large, are responsible for many of the required resurveys.

In the 19 areas of the Desert [redacted] identified [redacted], we estimate that at least 1 million acres will require survey. This work includes determining and posting boundaries, identifying the interior private holdings and mineral claims, completing surveys on outside lands for exchange purposes, and surveying for the related access program.

Each of the other sections that make up this part of the Report stressed the need for comprehensive planning--and has suggested what should be done in developing plans. In this section, we focus attention on those areas of planning not covered by the other sections.

Our goal is to identify where the BLM needs to increase its cooperative activities in those areas with several levels of government involved. This section examines the nature of existing and proposed non-Bureau planning efforts that affect BLM desert lands, other than those activities covered elsewhere in the Report; to analyze briefly the impact of this planning on BLM management programs; and to assess what additional planning efforts are needed to prepare a comprehensive plan for use and management of the California Desert.

GOVERNMENT PLANNING

Federal

If the Bureau is to launch a comprehensive desert planning program and make interim capital improvements, will there be any conflicts with the mission and responsibilities of other Federal agencies in the Desert? And what supporting role should the Bureau assume in helping these other agencies in reaching their National goals? As a resource management agency, the BLM is unique for it has both management and disposition authorities for public lands. Other Federal agencies usually lack authority to dispose of land. Some have no multiple-management authority. And some are oriented toward one or more function activities, such as sustaining or

increasing agricultural production. And still others have solely regulatory or special service missions, such as prevention of pollution.

In the past, the Bureau has not taken the initiative to develop management of public lands and resources because its national policy was fragmented, and may have been fully articulated. Consequently, other Federal agencies have seized the lead in planning for the use of BLM desert lands and resources strictly on a functional or single-agency program basis and without relating the plans to the needs of other agencies. Now that the Classification and Multiple Use Act is law and BLM's Planning System Manual 1602 and 1630 clearly defines policy, the Bureau should undertake cooperative desert planning and management program.

In a comprehensive planning effort for the Desert, the Bureau will be concerned with the plans and programs of:

Department of Interior:

- Bureau of Reclamation
- National Park Service
- Bureau of Indian Affairs
- Geological Survey
- Bureau of Mines
- Fish and Wildlife Service
- Bureau of Outdoor Recreation
- Federal Water and Pollution Control Administration

Department of Agriculture;

- Soil Conservation Service
- Forest Service

Department of Defense:

Department of the Army

Department of the Navy

Department of the Air Force

The Department of Health, Education, and Welfare

The Department of Transportation

The Department of Housing and Urban Development

National Aeronautics and Space Administration

State

More than any level of government involved in the Desert Study Area, the State of California has unique capabilities to influence planning for growth, development, and public welfare. It has the statutory power to provide for local units of government; to determine and control the taxing authority of its political subdivisions; and to define the relationships between Federal and state agencies, state and local governments, and between all government levels and the private sector.

Over time, and because of a strong tradition of home rule prevailing throughout California, the State has delegated much of its direct powers over development to local governmental entities and now exercises its influence indirectly over these local levels of government, primarily through grants or conveyances of land or other resources and through its legislative powers to encourage or control the actions of regional or local units and the private sector. Even in the area where the State takes direct action, such as the

programing and construction of public works, most of the projects involved are undertaken within the content of limited objectives, i.e., provision of highways, water supply, etc., and are not used as instruments of over-all or regional development policy.

Similar to the national level, there is a proliferation of state agencies in California that are responsible for a variety of functional activities and programs, many of which activities and pprograms will affect how the BLM plans for and manages the desert area. Some of these state agencies establish statewide standards and policies concerning California's natural resources, some establish land and resource controls that affect both government owned and privately owned lands, and others are oriented towards providing public services in a variety of fields such as health, education, business, transportation, and planning. The key agencies are:

State Resources and Development Agency

State Business and Transportation Agency

State Department of Finance

Human Relations Agency

Coordinating Council for Higher Education

Local

BLM policy requires the encouragement of well-planned private land use patterns by strongly supporting and encouraging local government land use planning. It further requires that the Bureau assist in the development of land use plans that are responsive to regional

needs. The Bureau has gone on record in recognizing that local government should have an effective voice on the classification and disposition of public lands.

Without a doubt local governmental entities within the Desert Area boundaries should actively participate in a BLM comprehensive planning effort.

The California Desert Area is either within or adjacent to the jurisdiction of some of the most advanced and sophisticated local planning agencies in the State. Five counties lie within the Desert Study boundaries: San Bernardino, Riverside, Imperial, Kern, and Inyo. In addition, the intensively populated counties of Los Angeles, Orange, Ventura, and San Diego have a major impact on the use of the desert. All of the counties within the Desert have active planning commissions and planning departments.

County planning and zoning in the three counties comprising the bulk of the desert study area varies. San Bernardino and Riverside counties have a completed and approved general (master) plan of land use. Imperial County has yet to complete a countywide comprehensive land use plan. The planning departments of all these counties are either in the process of completing general and detailed plans or reviewing and updating master plans. Degree of zoning according to the plan is: San Bernardino County, 25 percent; Riverside County, 17 percent; Imperial County, 50 percent. San Bernardino and Riverside counties have also prepared master plans for recreation and highways.

A number of cities within the desert counties have comprehensive master land use plans. The preparation of some of these plans was

or is now being financed in part by planning grants from the Department of Housing and Urban Development.

In the major desert counties of San Bernardino, Riverside and Imperial there are hundreds of functionally varied special districts. The statutory boundaries and responsibilities of these districts will have to be determined by the BLM so it can assess what impact they have on desert land use.

To solve problems that have a regional implication, six southern California counties have banded together and formed a regional planning commission called the Southern California Association of Governments (SCAG). This regional agency is a voluntary membership organization involving Ventura, Los Angeles, San Bernardino, Riverside, Orange, and Imperial Counties and a number of cities therein. SCAG has no implementing authority to carry out its recommendations.

PROBLEMS

The Bureau of Land Management is actively classifying its desert lands for either multiple use management or for disposal. It works closely with local governments to identify the needs of local communities for public land and resources and has sought local opinion and support for its classification decisions.

Zoning

If land is determined as suitable for transfer from Federal ownership, the BLM has encouraged the preparation of local government to prepare comprehensive plans and adequate zoning regulations for the land. Yet, the Bureau has not explored the preparation of joint

county-BLM comprehensive plans and zoning regulations for lands to be retained in Federal ownership and managed for multiple use. It has to date, lacked the planning and zoning expertise, time, and funds to do so.

The lack of more intensive zoning on Federal lands can lead to inequities in county regulation of uses that are similar on private and public lands. Such inequities destroy the intent of sound raster planning and zoning in a local area. Two of the largest counties in the Desert (San Bernardino and Riverside) already have zoned public lands in a broad land category.

The Bureau should begin a pilot effort, in cooperation with a county, aimed at zoning public lands that are to remain in Federal ownership in the Desert. It should consider establishing zones that identify flood plains, potential mineral development areas, critical wildlife habitat, waste disposal sites, archaeological and historical areas, proposed transportation routes, potential urban areas, and public facilities sites. And it should adopt regulations necessary for the use and protection of these areas. In this way, BLM could encourage sound planning that is consistent with local, regional, and national needs. It would secure local support for proposed land uses in the Desert. Joint planning and zoning would also increase the effectiveness of the local administrators in planning for the entire county and would lend additional support for BLM land classification decisions.

San Bernardino County has expressed interest in undertaking a joint planning and zoning effort with BLM for the desert lands within

county boundaries. The BLM should review this proposal with the Department of Housing and Urban Development (HUD) to determine the availability of funds to finance the county's effort.

Open Space

The State has recently completed a study of the open space requirements of the State's largest urban-metropolitan regions. The study identifies more than 669,000 acres of BLM desert land as suitable for open space, but such land was not considered as permanent open space. It is subject to disposal for a variety of uses not consistent with the definition of open space. The study recommended purchase of these and private lands for open space purposes by the state and by Federal agencies.

In light of the recognized impact BLM desert lands now have and will have on southern California's open space needs, the Bureau should work with State and local planning agencies to identify those Desert public lands that should have open space designation, to determine the permissible uses that could continue in these areas without destruction of the open space environment, and to develop the controls needed to preserve those public land areas from destruction and deterioration by incompatible uses.

PLANNING PROCESS

Determinations

The following is not complete listing of what BLM must consider in a comprehensive planning effort for the desert. But the Bureau should at least determine:

°The compatibility of military withdrawals with the location of new access routes and the construction of recreation and other facilities by the Bureau and other agencies lands.

°The anticipated future special uses that the military services will make of desert lands outside the boundaries of various land withdrawals, and their possible conflicts with other programs.

°The hazards that may be created by constructing new access routes near restricted military areas, new access routes in highly mineralized areas that will be subject to future indiscriminate mining activities, and capital improvements in geologically unsafe areas.

°The additional administrative costs that may be imposed on other agencies because of BLM opening up previously inaccessible areas to intensive public use (problem of trespass, fire protection, and the need for additional facilities).

°The total short-term (5 years) and long-term (1980) use and construction programs other Federal agencies intend to undertake on BLM desert lands, so that the Bureau can assess their impact on its own programs, can prevent loss of lands through its classification program, can prevent or reduce duplication of efforts by agencies, and can determine the administrative workload needed to prevent encroachment by incompatible uses.

°The environmental protection standards that should apply to BLM management programs in the desert. Such standards can

be a problem when other Federal agencies and state and local governments have not articulated national, statewide, regionwide, or countywide policy and procedures for protection of urban and rural environments.

Alternatives

The Bureau should explore several alternatives for coordinating its planning with the planning of all Federal agencies. The alternatives include cooperative planning: (a) under the aegis of the Department of Interior's Coordinator; (b) through the Pacific Southwest Interagency Committee which is concerned with coordinating the planning of many Federal agencies involved in the comprehensive framework river basin studies for the California region; (c) by working independently with each agency; (d) by creation of a desert land advisory committee which would consider the interrelated plans of all Federal, state, and local agencies and recommend plans to the Bureau; or (e) a combination of these alternatives.

Several alternatives for cooperative planning between the BLM and the State should be explored as in Phase III of the Desert Study. These include planning (a) through individual state agencies; (b) through the State Council on Intergovernmental Relations; (c) by inclusion of state representatives on a desert land advisory committee; (d) by formation of ad hoc committees to study and solve specific problems; or (e) by a combination of the alternatives.

Because of the numerous and diffuse local planning organizations operating in and around the Desert Study Area, the Bureau will be

faced with a massive undertaking in cooperating with such groups in developing a comprehensive plan. Some of the alternatives that the Bureau must explore for cooperative planning are: (a) working with each local level individually; (b) working through SCAG and its membership; (c) creation of a desert land advisory committee with appropriate representation thereon by local agencies; (d) working through a multi-county group that represents all local planning levels (no such group exists at present); or (e) a combination of these alternatives.

Related Programs

A number of related statewide and regional plans and programs will have an effect on developing a comprehensive desert plan. The Bureau will need to work with appropriate agencies to assess its role in cooperating with and supporting these programs.

1. Airport facilities needs of the southern California area, particularly around the Los Angeles metropolitan area. If BLM desert lands are considered as having potential for airport facilities location, the BLM will have to consider the impact of such construction on the public land and resources.

2. Identification and reservation of industrial potential areas in the Desert which revolve around the availability of minerals, water, and power. In cooperation with the State Division of Mines and Geology, the BLM should seek to identify those desert areas with mineral deposits of value that will be needed in the future.

3. Developing public-land category classification codes with the State Office of Planning that will be compatible with the ones developed by the Southern California Association of Governments.

4. Development of a joint BLM-state lands use policy that will identify the role of BLM and the state in developing, managing, and preserving the desert environment.

5. Expansion of the state effort at photomapping in southern California to include the Desert Area. The BLM should identify where the state has progressed in its photomapping program and undertake additional coverage of the Desert at a similar scale.

6. Inventory of special study programs underway in the southern California area which may have an impact on the Desert.

ECONOMIC ANALYSIS

Long and short run management plans for the California Desert must be economically sound if we are to maximize benefits from the Desert's resources. Economic evaluation is also necessary in selecting best alternatives for meeting objectives within budget limitations, and resolving conflicts among uses of these resources.

This report (a) summarizes the socio-economic factors that affect the California Desert, (b) identifies benefits of existing and proposed programs, and losses due to delayed action or total inactivity, and (c) outlines the need for economic studies to be undertaken in the next phase of the Desert Study, which will establish a factual profile of the economic resources of the California Desert, including a measurement of their availability and the present and potential demands for or uses of these resources.

Socio-Economic Factors

About 60 to 65 percent of the people in California live in the area directly west of the California Desert. Demands for use of public lands for recreational pursuits are directly traceable to the population pressures and to the economic growth of the entire Southern California area.

Population.--Rapid population increases in the San Diego and Los Angeles Areas began during World War II and continued into the 1960's. Recent trends, however, indicate a decrease in the rate of population growth. This trend may be attributed to air and land pollution problems, population concentration, and to some extent--lack of land for industrial expansion. Because of land patterns, the only migration can be toward the Desert.

Projection of population trends in the 14-county Southern California area suggests a 40 percent increase by 1975 and nearly 80 percent increase by 1980 (tables 1,2).

Income in Southern California is generally high, ranking among the top in the nation. Personal income in the 14-county area made up about 63 percent of the State's total income. The greatest increases in income were found in the counties which moved from an agrarian economy to an industrial economy.

The number of poverty stricken in the Southern California area is low--as is the number of very wealthy. The bulk of the population enjoys a middle income--neither substantially higher nor lower than other major metropolitan regions of the United States.

Per capita personal income ranges from $2,111 in San Bernardino County to $3,028 in Los Angeles. For the 14-county area the per capita rate is $2,748 (table 3).

Employment.--Growth in employment in the California Desert Area has paralleled the increase in population since World War II. But there have been some declines, for example, in agricultural employment. Major increases have occurred in manufacturing, services, trade, transportation, and government.

Manufacturing (conversion) has the single largest employment impact in the region, while that of the extractive sector is extremely low--except in Imperial and Riverside counties (table 4). Mining employs few people, but this condition fails to reflect the potential of the industry.

Unemployment rates fluctuate noticeably. Most recent published data show Unemployment in the Los Angeles Area is about 4.5 percent of a 3,064,900-civilian labor force compared to 6.2 percent unemployment of a labor force of 340,000 in the San Bernardino-Riverside-Ontario Area. These figures reflect the inherent tendency for higher unemployment in the agriculture sector (table 5).

Leisure Time.--Recreational demands of all types, but especially outdoor activity, increase directly as leisure time and disposable income increase. Expenditures for recreational activities are at their peak. Present rate of spending for recreation is approximately 6 percent of personal disposable income. Personal disposable income currently exceeds $2,000 per capita nationwide. In Southern California it can be assumed that the level is somewhat higher. Under present conditions, an increase of 36 percent above the present level may be expected by 1980, and possibly a rate of 100 percent or even more by the year 2000.

Small changes in leisure time can inflict excessive impact upon demands and use patterns. Leisure time available in the heavily populated Southern California Area will experience an 84 percent increase by 1980 over what it was in 1960. Presently, weekends and holidays account for over 40 percent of the leisure time. Vacation periods account for 6 to 8 percent of free time.

A most important demand change which will have an immediate rather than gradual impact in preparing economic projections for recreational needs is the national restructuring of holidays. Public

Law 90-63, dated June 23, 1968, increases the number of legal holidays to nine. As of January 1, 1971, the law provides for five, three-day holiday weekends, annually, whereas heretofore only Labor Day consistently assured an extended weekend.

In preparing recreational programs for Phase III of the Desert Study, economists and planners should incorporate these holiday changes into projected demands. Seasonal use of desert facilities will be directly affected by at least three of these holidays and probably all of them.

Other factors, which are not as imminent, but must be considered in future planning, are the 4-day work week and trends toward earlier retirement age. The advent of the 4-day work week may reach fruition during the 1970's. Desert recreation demands would then increase beyond any capacity now considered.

Another economic indicator attributable to the rapid increase of outdoor recreation is sales trends in motor vehicles. About 80 percent of recent light-truck sales have been of the custom-made recreation vehicles or pickup models adaptable to camper components. About 70 percent of all light trucks are now used for personal transportation and recreation. Major automobile manufacturers estimate the pickup-camper market will increase 58 percent by 1980.

Known Economic Benefits

Recreation.--Detailed data are not now available to determine expenditures of individual recreationists for desert activities, but estimates can be made from similar recreation uses. Expenditures

will vary with types of activities and length of visits. Because of the lack of definitive values for outdoor recreation, Senate Document #97 assigned values for Government agencies to use. The values are intended to measure the amount users would be willing to pay if payment were required. Values range from (1) $.50 per visitor-day for undeveloped recreational facilities (usually access only); (2) $1.00 per visitor-day for partially developed but limited basic facilities; (3) $1.50 per visitor-day for fully developed facilities, including parking, water, camping sites, picnic tables; and (4) specialized recreational day values ranging from $2.00 to $6.00 for activities where opportunities are generally limited, intensity of use is low, and personal expenses are normally large.

91 If we assume that recreationists using the desert lands of California average $5.00 per person per day, roughly $25 million in expenditures could be attributed directly to desert recreation for 1968. Total impact of this expenditure would be further increased by the multiplier impact of our economic system. If the anticipated 50 million visitor-days projected for the year 2000 are achieved, it is obvious that the economic impact will be substantial.

Economic impact on local communities resulting from recreational expenditures greatly exceeds those stipulated under Senate Document #97. Such impact on communities within and outside the Desert Area cannot be measured solely by total expenditures from the recreationists. Local income, employment, and sales are all influenced by recreation expenditures. And these measures of the local economy tend to move

together; that is, as sales rise, value added and employment generated also tend to rise.

A result of the expenditure pattern is an economic multiplier process. Multipliers vary from community to community and will vary also with size of the impact area, and with type of consumer and recreation expenditure. Formulas are available to calculate the multiplier impact upon a given community, but data for the desert regions are insufficient to provide a definitive indicator. But data for such desert communities as Barstow and Needles suggest that for every dollar spent by the recreationist stimulates from $1.35 to $1.75 in additional spending. Multipliers for specific purchases may run from $1.25 to $1.30 for gasoline station purchases and approximately $1.80 to $1.95 for food and beverages.

Local impact of expenditures do not reflect multiple effects resulting from purchases of motorcycles, dune buggies, and other such equipment. Production of these items result in increased job and income for larger trade centers. Even though these effects are far more difficult to determine, it can readily be seen that increased recreational activity in the Desert will have significant economic impact.

Minerals.--The most important economic impact upon a local community, resulting from mining is employment. Only minor machinery and equipment sales result locally, especially in the Southern California Area. Most large equipment is sold in Metropolitan Los Angeles.

Mining employment in the Desert Region is small compared to other economic sectors. Within the 5-county Desert Area, employment for the mining industry totalled 3,896 in 1963 (the most recent actual census data). Mining payroll for the period was $26,309,000. For the total economy of the desert impact area, including Los Angeles Metropolitan Area and San Diego, employment for the mining industry was 14,702. The payroll amounted to $111,493,000. Under present conditions, employment for the mining industry within the Desert can be expected to increase no more than 5 to 10 percent by 1980. Technical advances in mining methods will allow sizable increases in production, but with only minor increases in employment.

Total mineral sales have increased by about 24 percent during the period 1963 through 1967. Value of mineral production for 1963 was $283,123,000 and for 1967 it increased to $348,843,000. Sand and gravel represented the largest single mineral sales for the combined counties (table 6). Rapid increases in Southern California's building and highway construction account for the steady increased need for sand and gravel.

How much of the mineral production and mining can be attributed to public lands in unknown. Income figures, by land ownership, reflect spurious data because of methods for obtaining property. Land patented by various homestead acts conveyed different interests to settlers. The Homestead Act of 1862 conveyed fee title; later acts reserved coal and associated minerals. The Stock Raising Homestead Act of 1916 reserved all minerals to the United States.

Sand and gravel is the only ubiquitous mineral in the desert. But it is a source of conflict in recreation plans because it is

an open-pit, extractive, heavily demanded resource. Detailed inventory of known deposits, both as to location and reserves, should be undertaken early in a phase III Desert Study.

Value of sand and gravel sales for 1967 was $37,408,000 for the 6-county Desert Area. It may be expected that this value could increase to between $80,000,000 to 100,000,000 by 1980. Amount of this mineral taken from public land is somewhat nebulus. Total value of recorded free use and sales of sand and gravel, stone, and highway material from the BLM was $151,921 for 1968. It is highly unlikely, however, that this figure reflects the true amount of these minerals taken from public lands.

Sand and gravel located on public land offers even greater future potential. Demand is directly influenced by building and construction industries. Any impact upon employment in the mineral industry will be slight because great changes in demand will result in only minor increases in labor owing to the degree of mechanization.

Range Forage.--Use of the California Desert for livestock feed amounts to about 200,000 AUM's covered by 65 leases on Section 15 lands and 30 licenses on Section 3 lands. Actual value realized by the BLM for this forage has been $66,000 annually. Increased rates will eventually bring the income to $300,000 for the same amount of forage. Range condition, precipitation, and other factors lack promise of increasing the amount of forage to be provided.

Feed requirements for the livestock population in the desert region as of January 1, 1968, totalled 12,037,000 AUM's. Total feed

requirements for the 25,000 cattle and 128,000 sheep amounts to 607,000 AUM's. When desert conditions are favorable, BLM lands furnish nearly 29 percent of the feed required for the animals permitted, and 1.4 percent of feed requirements for all livestock in the desert counties.

During the past 15 years, cattle numbers have increased steadily while sheep numbers have continued to decrease noticeably. These changes follow the national trend (table 7). The livestock industry can be expected to increase no more than 2 to 3 percent annually.

Dependency upon BLM forage in the desert must be considered small and unreliable. Variations in annual amounts of forage preclude operators from programing forage needs to include desert land use. Increase in grazing fees may further change patterns of use on Public lands. Conceivably, dependency may decrease further.

Wildlife.--The two types of people who have the most interest in wildlife are the hunter and the naturalist (including sightseer). Insufficient data are available to comment realistically on the economic impact of wildlife. The Phase I desert study indicates that approximately 530,000 Gambel's quail were taken during 120,000 hunter-days in 1963. If we use the values established in Senate Document #97, a small-game hunter can be expected to spend between $5 and $6 per hunter-day. Therefore, an impact on the local economy of $975,000 to $1,000,000 is realized. The local economic multiplier for small game hunting in the Desert is estimated to be about the same as for recreation, or $1.50 to $1.60 for every dollar spent.

The estimate that number of hunters for game bird will increase 100 percent by 1980 seems realistic--provided bird population increases proportionately. All types of hunting will probably increase, but as recreation in the Desert becomes more popular, the naturalist interest in wildlife may grow even more rapidly.

Land.--In addition to other amenities, the California Desert offers potential for irrigated agricultural use. Large areas of potentially irrigable lands exist in the Mojave Desert near Victorville, Barstow, Lucerne Valley, Yucca Valley, and the Coachella Valley. Irrigated acreages of the Imperial Valley can also be expected to increase so long as water is available. The amount of irrigated acreage is expected to increase over the 1960 figure by nearly 35 percent or 1 million acres by 1975.

Water from Northern California delivered to the desert to recharge underground reservoirs as well as continued water developments along the Colorado River, may provide additional water for use. If so, a combination of long growing seasons, growing multiple crops annually, nearness of markets, and large land areas will enhance the value of some desert lands for agriculture.

In addition to the potential for irrigated agriculture, certain desert lands near existing communities are valuable for increased urban-suburban development. Expansion of industry in Southern California may also result in new communities being carved out of the desert lands.

Future Economic Studies

Vital as it is for the Bureau to develop quickly a comprehensive desert management plan, it cannot do so without collecting information about the location of, amount of, and demand for desert resources and their uese. It needs to study the problem of competing uses and of resource conflicts resulting from policy issues. In developing a desert management plan, the Bureau must make certain assumptions. Paramount among these are that demands and changes will be evolutionary rather than radical departures or drastic shifts from existing economic and social trends. And planning on the basis of the information gathered should concentrate on social and economic forecasts and projects.

The most significant social change that should be anticipated is the steady growth in population. Within this change, area of residence, spatial concentration, and age distribution are significant factors. For economic analysis, stress should be placed on national economic conditions, income distribution, structure of income levels, amount of disposal income, leisure time, and mobility.

The basic questions that need answers in economic studies are: What is at stake? What should be done? And what approach should be taken?

Economic Base Study.--The interrelationships among resources and their demand and uses are best determined by an Economic Base Study of the California Desert. This type of study would provide data on present uses of known resources as well as provide a base for

projecting future use and development of resources identified in the Phase III study. Using information provided by the study, management would then be able to set up priorities among uses of resources, and, array alternative opportunities necessary for effective decision-making.

The major elements of such a study would include:

1. An input/output mathematical model.
2. Inventory and analysis of economic activity in the Desert and its relationship to economic activity outside the area.
3. Development of a profile of the resources supplied by the California Desert.
4. Development of a profile of demand variables, or uses of desert resources.
5. Projections of future economic activity in the Desert Area for the years 1980 and 2000, based upon assumptions of continued economic growth and development.

Conducting the Economic Base Study can be done either in-house by Bureau economists or under contract with an economic consulting firm. Considering the Bureau's present budget and manpower ceilings, it is doubtful that Bureau economists would be available for the period of time necessary to make the Study. For the purpose of this report, however, manpower and cost estimates are provided for both an "in-house" study, as well as contracting the study.

While the Economic Base Study could start out at the same time resource inventories are started it would seem logical to phase the

base study into the on-going inventories in program year 3 or a 5-year comprehensive planning effort. We assume that various resource inventories (e.g. watershed rating analysis, intensive vegetative surveys, etc.) would be reaching a point where data would be available for analysis.

Other Economic Studies.--The criteria for desert management decisions should utilize every tool possible in assigning value judgments. Investments in the desert in the future by BLM should be in areas where the greatest good for the greatest number of people will be served. In the case of planning for recreation use of the deserts lands, economic analysis should provide an integral input into engineering design specifications. Maximum cost effectiveness and the highest benefit-cost relationship.

In addition to the Base Study, the Bureau should include economic analyses in other Desert studies. Economic evaluation could yield data that, for example, would be part of engineering design specifications in recreation planning. The aim of such studies would be to determine the maximum cost effectiveness and the highest benefit cost relationship. As examples of how analyses might be used to obtain benefit cost ratios in construction, we can use information gathered for "The California Desert Study" report.

Engineering and construction costs for the Chuckwala recreation site were $67,270. The costs for recreation projects are normally amortized over a 20-year life expectancy at 3-1/4 percent. Assume that maintenance is 5 percent of cost annually and that the cost of a supervisor's time (half-time) is $7,000 per year. ~~Annual~~

Annual equivalent cost is about $11,106. Assuming constructed facilities could accommodate normal daily visitors and at least one-half of heavy weekend use, 75 percent of the 23,000 annual visitor-days for 1968 could be valued at $1.50 per visitor-day, and 25 percent at $1.00. Value of annual benefit accruing was roughly $31,600, yielding benefit-cost ratio of about 2.9:1 for the Chuckwalla site.

Afton Canyon project costs were $32,687. Again assuming 5 percent annual maintenance and one-half of a caretaker's time and costs amortized over 20 years, annual equivalent costs are $7,420. Limited units (25 constructed units) can be expected to accommodate no more than 10 percent of the estimated 42,000 annual visitor-days at maximum use. Another 15 percent may have access to limited use, and the remaining 75 percent limited to undeveloped use-patterns. Value of benefits are approximately $28,400, yielding a benefit-cost ratio of 3.8:1. The favorable benefit-cost ratios for the above recreation sites would indicate that a favorable or positive benefit-cost ratio for a total desert recreation management system would be realized.

It must be realized that values used are only approximations. Undoubtedly certain costs have been neglected and benefits are only estimates. But the basic premise is that recreation projects provide benefits to many people and deserve high priorities in budgetary allocations.

In Phase III of the California Desert Study and many programs resulting from it, benefit-cost ratios alone will be inadequate in selecting project priorities. Instead, early decisions covering

the Desert System must also be made on the basis of cost effectiveness.

The question of charging a fee for recreational use is a case in point. Detailed economic analysis should be undertaken before selecting areas where entrance fees may be tried. Analysis should include accurate data on origins of visitors, distance traveled, average cost per user, and if recreationists would be willing to pay for facilities provided and if so, to what extent. Simple questionnaires may provide the best method of obtaining information. With valid data, it should be possible to make specific projections as to the impact resulting from fees.

(8)

Table 1.--Population of Southern California Counties and the State, 1960 and projected

County	July 1 1960	Projected		
		July 1 1970	July 1 1975	July 1 1980
Imperial	73,000	86,700	94,200	103,000
Inyo	11,700	11,900	12,100	12,400
Los Angeles	6,071,900	7,630,800	8,430,800	9,241,500
Orange	719,500	1,473,800	1,815,700	2,144,400
Riverside	311,700	506,200	610,000	722,000
San Bernardino	509,000	722,700	841,000	969,400
San Diego	1,049,000	1,407,700	1,593,000	1,800,100
Total	8,745,800	11,839,800	13,396,800	14,992,700
14 Southern Counties	10,087,700	13,846,500	15,779,300	17,804,400
California	15,863,000	21,734,000	24,830,000	28,137,000

Source: California Department of Finance

Table 2.--Actual and projected changes in population in Southern California Counties, and the State, by decades 1960 - 1980

County	Numeric Changes (all positive)			Percentage Changes (all positive)		
	1960-70	1970-80	1960-80	1960-70	1970-80	1960-80
Imperial	13,700	16,300	30,000	18.8	18.8	41.1
Inyo	200	500	700	1.7	4.2	6.0
Los Angeles	1,558,900	1,610,700	3,169,600	25.7	21.1	52.2
Orange	754,300	670,600	1,424,900	104.8	45.5	198.0
Riverside	194,500	215,800	410,300	62.4	42.6	131.6
San Bernardino	213,700	246,700	460,400	42.0	34.1	90.5
San Diego	358,700	392,400	751,100	34.2	27.9	71.6
14 Southern Counties	3,758,800	3,957,900	7,716,700	37.3	28.6	76.5
California	5,871,000	6,403,000	12,274,000	37.0	29.5	77.4

Source: California Department of Finance

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Table 3.--Changes in personal income in southern California counties and the state, 1961

County	Personal Income	Change 1947-1961	Change 1960-1961	Per capita Income	Families under $3,000
		percent			percent
Imperial	$ 192,829,000	+ 90.4	+ 2.0	$ 2,541	21.1
Inyo	26,483,000	+ 143.0	+ 8.4	2,267	19.6
Los Angeles	18,887,757,000	+ 174.5	+ 4.7	3,028	12.6
Orange	1,865,284,000	+ 635.0	+ 15.6	2,335	11.1
Riverside	697,231,000	+ 234.6	+ 7.0	2,116	20.5
San Bernardino	1,115,470,000	+ 269.3	+ 7.3	2,111	17.1
San Diego	2,735,658,000	+ 279.8	+ 5.6	2,496	15.0
Total	25,520,642,000				
14 Southern Counties	28,804,989,000	+ 193.4	+ 5.7	2,748	13.4
California	45,586,000,000	+ 174.0	+ 5.7	2,771	14.1

Source: Research Department, California State Chamber of Commerce

Table 4.--Employment in southern California, type of work, 1950-19

Location	EXTRACTION			DISTRIBUTION		
	1950	1960	Percent Change	1950	1960	Perc Char
Imperial	8,519	10,893	+ 20	6,966	7,189	+
Inyo	925	654	+ 3	1,592	1,399	-
Los Angeles	41,490	35,878	- 14	491,155	590,691	+
[illegible]no	189	79	- 58	172	211	+
Orange	11,073	9,961	- 10	20,991	58,781	+
[illegible]rside	10,962	13,877	+ 27	16,312	26,621	+
San Bernardino	10,315	9,470	- 8	30,582	45,217	+
San Diego	13,207	9,934	- 25	49,458	74,737	+
Santa Barbara	7,119	5,736	- 19	11,012	15,108	+
Ventura	10,259	11,813	+ 15	10,972	15,557	+
Total	114,058	108,295	- 5.1	639,212	835,511	+ 30

[illegible]: California Department of Finance

Table 4.--Employment in southern California, type of work, 1950-1960

Location	EXTRACTION			DISTRIBUTION			SERVICES			CONVERSION		
	1950	1960	Percent Change	1950	1960	Percent Change	1950	1960	Percent Change	1950	1960	Percent Change
Imperial	8,519	10,893	+ 20	6,966	7,189	+ 3	4,645	6,717	+ 45	2,649	2,523	- 5
Inyo	925	654	+ 3	1,592	1,399	- 12	1,350	1,734	+ 29	889	724	- [illegible]
Los Angeles	41,490	35,878	- 14	491,155	590,691	+ 21	537,517	771,163	+ 44	530,194	852,993	+ 61
[illegible]no	189	79	- 58	172	211	+ 23	334	531	+ 59	314	191	- 39
Orange	11,073	9,961	- 10	20,991	58,781	+ 180	20,007	71,361	+ 256	19,855	91,852	+ 360
[illegible]rside	10,962	13,877	+ 27	16,312	26,621	+ 63	17,044	37,689	+ 121	9,288	23,691	+ 155
San Bernardino	10,315	9,470	- 8	30,582	45,217	+ 48	27,344	62,683	+ 129	22,557	42,561	+ 89
San Diego	13,207	9,934	- 25	49,458	74,737	+ 51	66,453	117,440	+ 77	37,591	97,843	+ 160
Santa Barbara	7,119	5,736	- 19	11,012	15,108	+ 37	14,162	23,143	+ 63	5,016	14,126	+ 181.6
Ventura	10,259	11,813	+ 15	10,972	15,557	+ 42	13,815	24,535	+ 77	5,373	13,074	+ 143
Total	114,058	108,295	- 5.1	639,212	835,511	+ 30.7	702,671	1,116,996	+ 59	633,276	1,139,308	+ 79.8

Source: California Department of Finance

Table 5.--Civilian labor force, employment and unemployment southern Calofornia labor market area, 1960 and 1966

Labor Market Area or County	Civilian Labor Force	Employment	Unemployment	Unemployment Rate %
Los Angeles - Long Beach				
1960	2,634,400	2,488,400	145,100	5.5
1966	3,064,900	2,924,100	139,100	4.5
Anaheim-Santa Ana-Garden Grove				
1960	211,900	199,500	12,400	5.8
1966	386,700	370,300	16,400	4.2
San Diego				
1960	330,100	309,000	21,100	6.4
1961	360,100	341,400	18,700	5.2
San Bernardino-Riverside-Ontario				
1960	268,600	251,000	17,600	6.6
1966	340,000	318,900	21,100	6.2
Oxnard-Ventura				
1960	72,800	68,700	4,100	5.6
1966	101,700	95,600	6,100	6.0

Source: State of California, Department of Employment

Table 6.--Total mineral sales in Imperial, Inyo, Orange, Riverside, San Bernardino, San Diego counties, 1963-1967

Mineral	1963	1964	1965	1966	1967
			Thousand dollars		
Sand & Gravel	29,229	30,313	30,237	34,336	37,408
Stone	12,353	15,098	15,919	16,835	16,974
Clays	2,608	2,933	2,641	1,759	1,983
Lead	177	404	561	569	455
Silver	161	199	220	217	209
Natural Gas	9,464	9,536	9,219	9,400	8,682
Nat.Gas Liquid	7,939	7,748	8,622	8,197	7,907
Petroleum	79,295	79,461	86,472	92,947	93,946
Talc	1,386	1,568	1,679	1,816	1,918
Unapportioned 1/	87,802	165,418	161,535	171,204	179,740
Total	282,123	312,778	317,076	337,311	348,843

1/ Includes boron minerals, copper, molybdenum concentrate, perlite, pumice and volcanic cinder, sodium carbonate, tungsten concentrate, wollastonite, zinc, gold, gypsum, lime, mica, salt, cement, iron ore, rare earths.

Source: California Division of Mines and Geology

Table 7.--Cattle and sheep in southern California, by counties, 1967 and 1968

County	Cattle & Calves January 1		Stock Sheep & Lambs January 1	
	1967	1968	1967	1968
Imperial	401,300	369,600	6,500	3,000
Inyo	21,000	22,000	200	200
Orange	40,500	41,300	200	200
Riverside	219,400	238,400	22,500	25,000
San Bernardino	109,000	104,400	9,000	11,400
San Diego	63,300	62,800	900	900
Sub Total	854,500	835,500	39,300	40,700
Los Angeles	168,700	153,900	30,900	27,700
Total	1,023,200	989,400	71,200	68,400

Source: California Crop and Livestock Reporting Service

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